INDUCED SEISMICITY AND EARTHQUAKE PREDICTION STUDIES IN SOUTH CAROLINA

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USGS CONTRACT NO. 14-08-0001-17670
Supported by the EARTHQUAKE HAZARDS REDUCTION PROGRAM

OPEN-FILE NO. 81-93

U.S. Geological Survey
OPEN FILE REPORT

Tenth Technical Report

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by

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and

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April 1980

Sponsored by the U. S. Geological Survey
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ABSTRACT

This report presents data on induced seismicity studies in South Carolina up to September 1979.

The low level seismicity at Lake Jocassee was interrupted by a M_{bLg} 3.7 earthquake on August 25, 1979 (9:31 PM local time). This intensity VI event was the largest event to occur at Lake Jocassee and it was widely felt. Its focal mechanism revealed a large component of normal faulting. Comparison with earlier focal mechanisms and stress measurements suggests that only a thin veneer ($\sim$ 1.5 km) of the near surface rocks are highly stressed.

In addition to the routine analysis of seismicity data at Monticello reservoir, we analysed in detail 180 events recorded on analog tapes between July and December 1978. This detailed analysis revealed that the seismicity is shallow (< 2 km), appears to spread in discrete jumps and occurs along existing joint and fracture planes by the diffusion of pore pressure to hypocentral depths.

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I. INTRODUCTION

This report describes the results of monitoring seismic and other parameters at Lake Jocassee together with the seismicity at Monticello reservoir. The locations of these sites are shown in Figure 1.

In this reporting period we continued to monitor seismic activity at Lake Jocassee (Section II). The largest recorded event at Lake Jocassee occurred at 9:31 PM (Local time) on August 25, 1979. This widely felt M_{bLg} 3.7 event is described in Section III. Radon concentration in ground water and soil were also measured near Lake Jocassee. These will appear in a paper in Journal of Geophysical Research. A preprint of the paper together with the raw data are given in Appendix IX.

The classical example of reservoir induced seismicity at Monticello reservoir was further studied. Routine data using the four station SCE&G seismographic network and JSC are presented in Section IV. Detailed analysis for 180 well recorded events on analog tapes and on portable seismographs (July - December 1980) are presented in Section V.

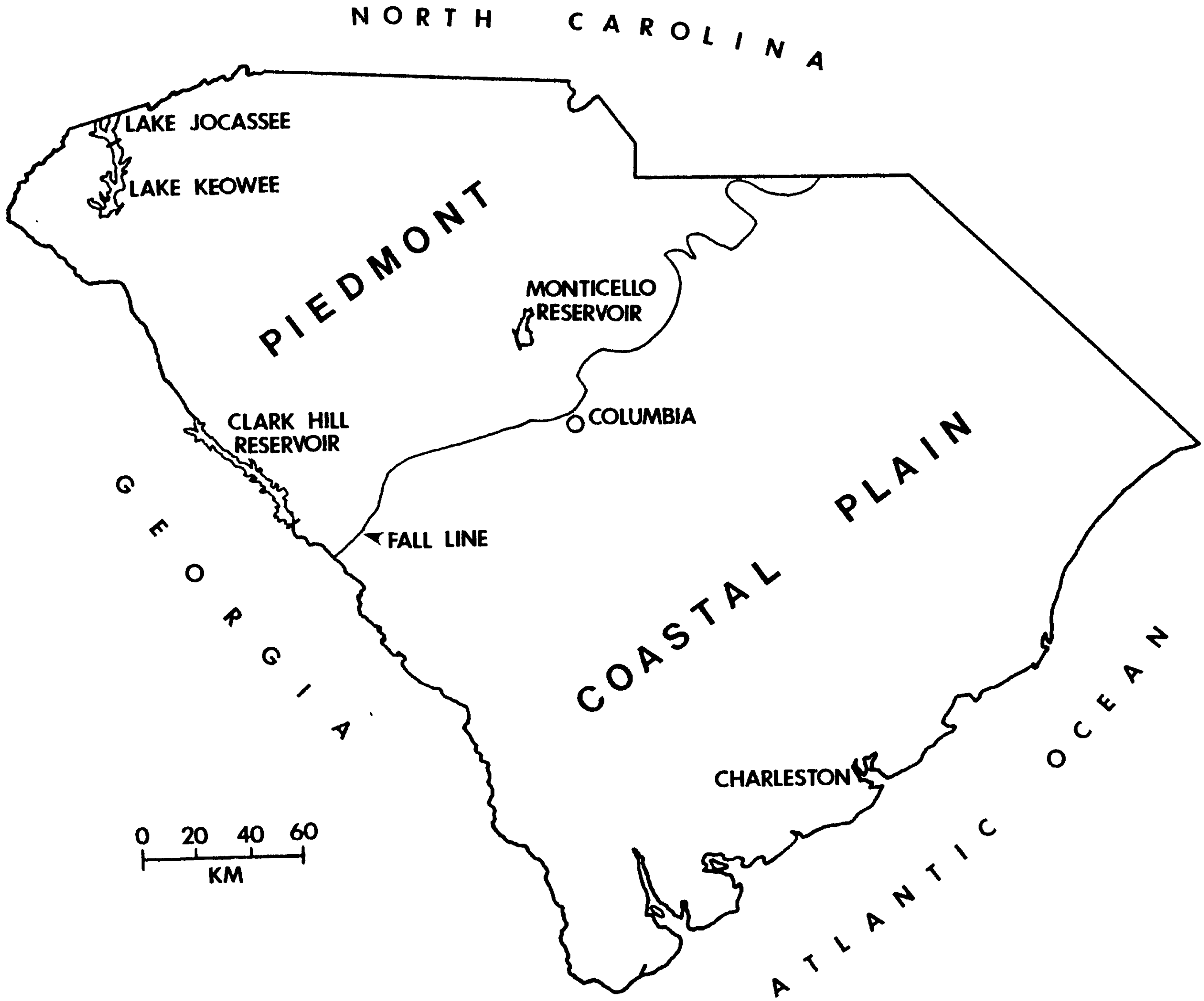

NORTH CAROLINA
LAKE JOCASSEE
LAKE KEOWEE
PIEDMONT
MONTICELLO RESERVOIR
CLARK HILL RESERVOIR
COLUMBIA
GEORGIA
FALL LINE
COASTAL PLAIN
CHARLESTON
ATLANTIC OCEAN
0 20 40 60
KM

Figure 1

II. SEISMIC ACTIVITY AT LAKE JOCASSEE (APRIL 78 - SEPT. 79)

II.1. *Seismic Station Deployment*

Four portable siesmographs (Sprengnether MEQ 800 model) together with the permanent station at SMT were used until October 1978. In October 1978 Duke Power Company added two permanent stations, one at BG3 replacing the portable unit and another at a new site, LPM. All portable seismographs were removed in January 1979. All seismic data after this were collected from the three remaining permanent stations (BG3, SMT, LPM). After a magnitude 3.7 event on August 25, 1979 we reoccupied our portable sites until September 15, 1979, carrying out an aftershock survey. (The August 25 event is discussed in Section III.) The location of sites occupied are listed in Appendix I and are shown by the symbol ✱ in Figure 2. In later discussion and in tables the location number (first column) will be used when referring to a particular station. The deployment times for portable stations for March 1978 - December 1978 are shown in Figures 3A and 3C.

II.2. *Results*

In an effort to obtain more accurate event locations a velocity model for the Lake Jocassee area was developed. In September 1978 four holes were drilled and loaded with approximately 150 lbs. of explosives in each hole. Two reversed refraction lines were shot. These lines (AB, CD) are shown in Figure 4. The velocity model obtained (Appendix II) was used in locating events with HYPO71 (Lee and Lahr, 1972). The location accuracy is about ±200 m and depths are usually good to ±400 m.

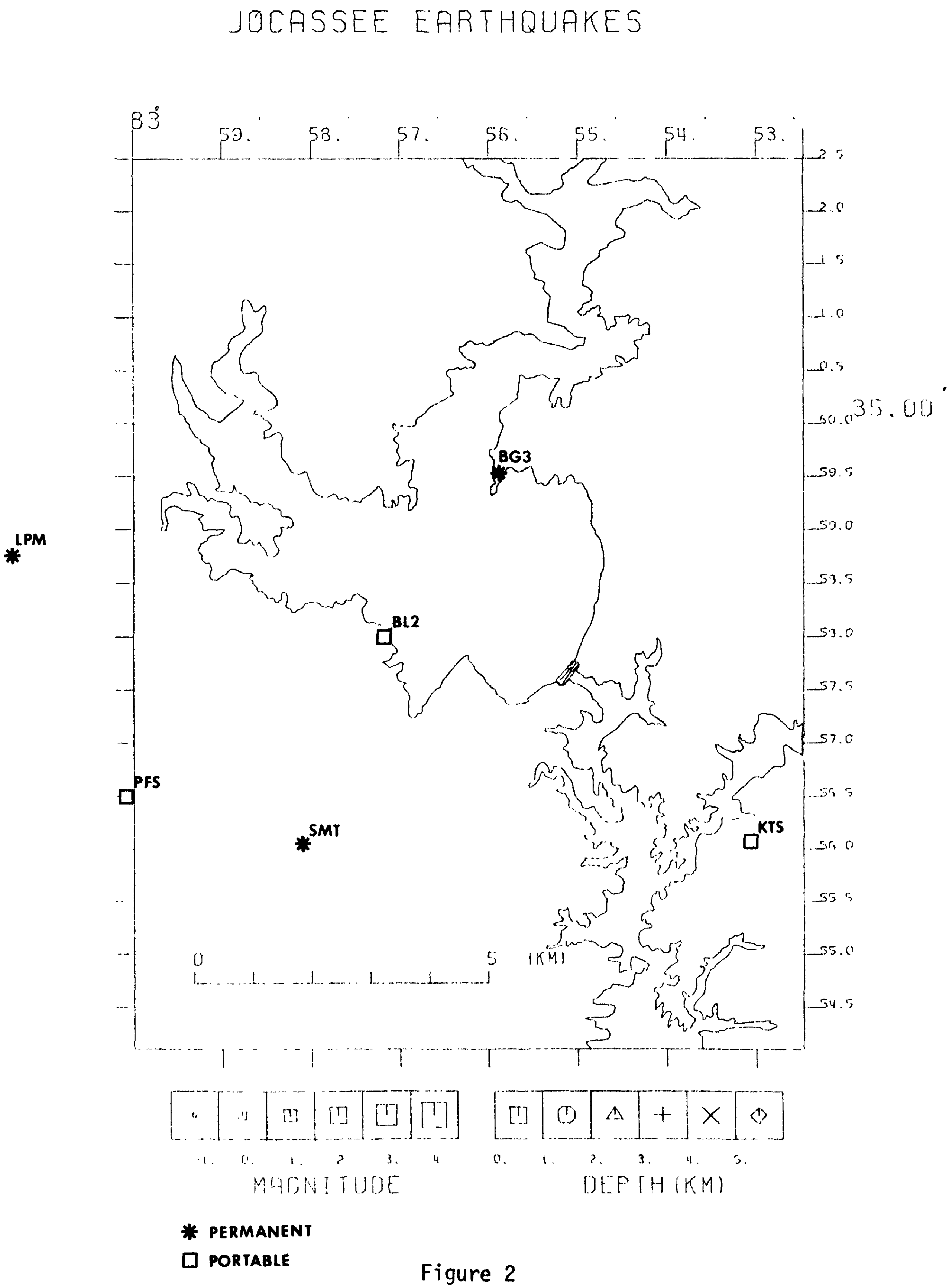

JOCASSEE EARTHQUAKES
83°
59.
58.
57.
56.
55.
54.
53.
35.00'
BG3
LPM
BL2
PFS
SMT
KTS
0
5
(KM)
MAGNITUDE
DEPTH (KM)
PERMANENT
PORTABLE

Figure 2

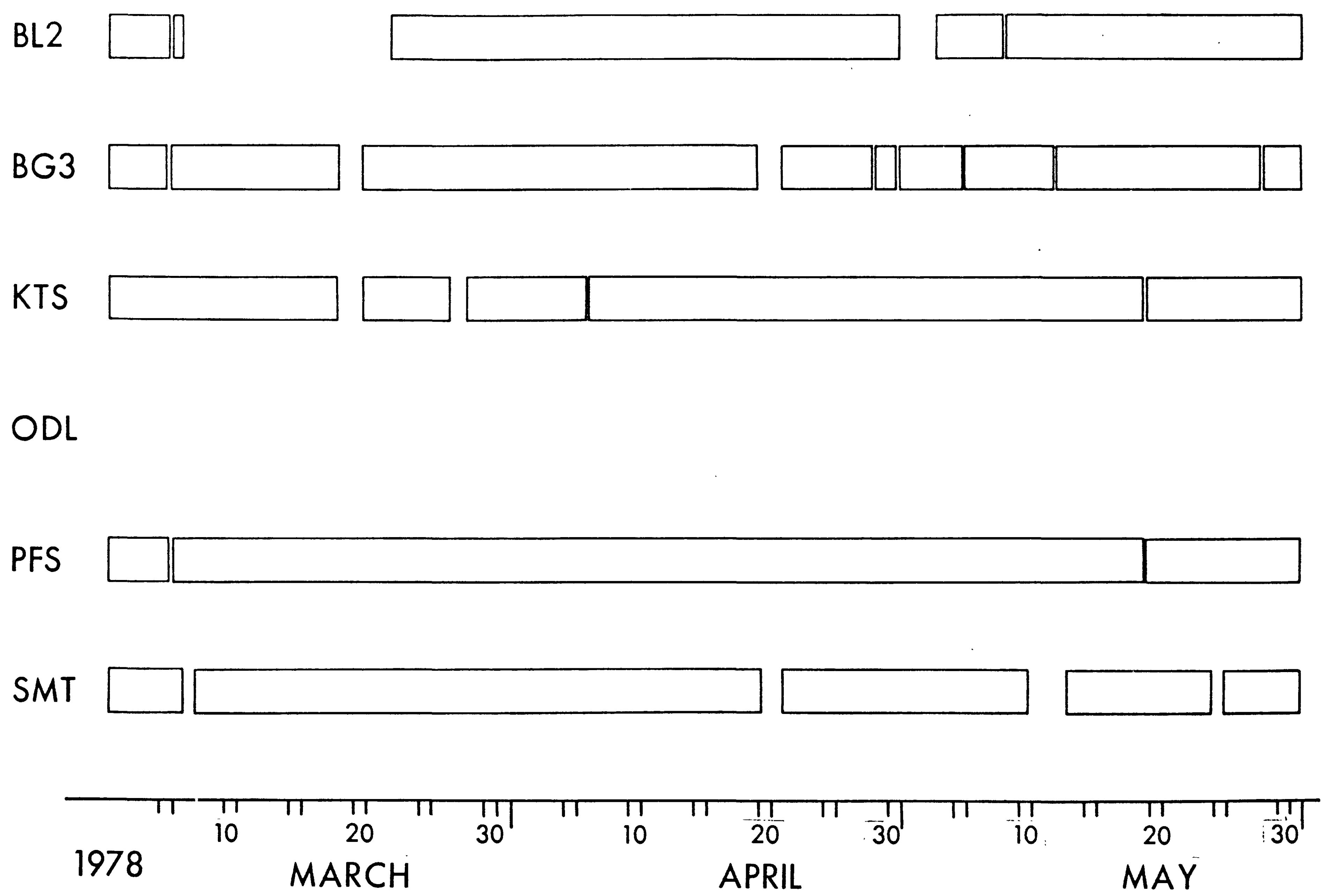

BL2
BG3
KTS
ODL
PFS
SMT
10
20
30
10
20
30
10
20
30
1978
MARCH
APRIL
MAY

Figure 3A

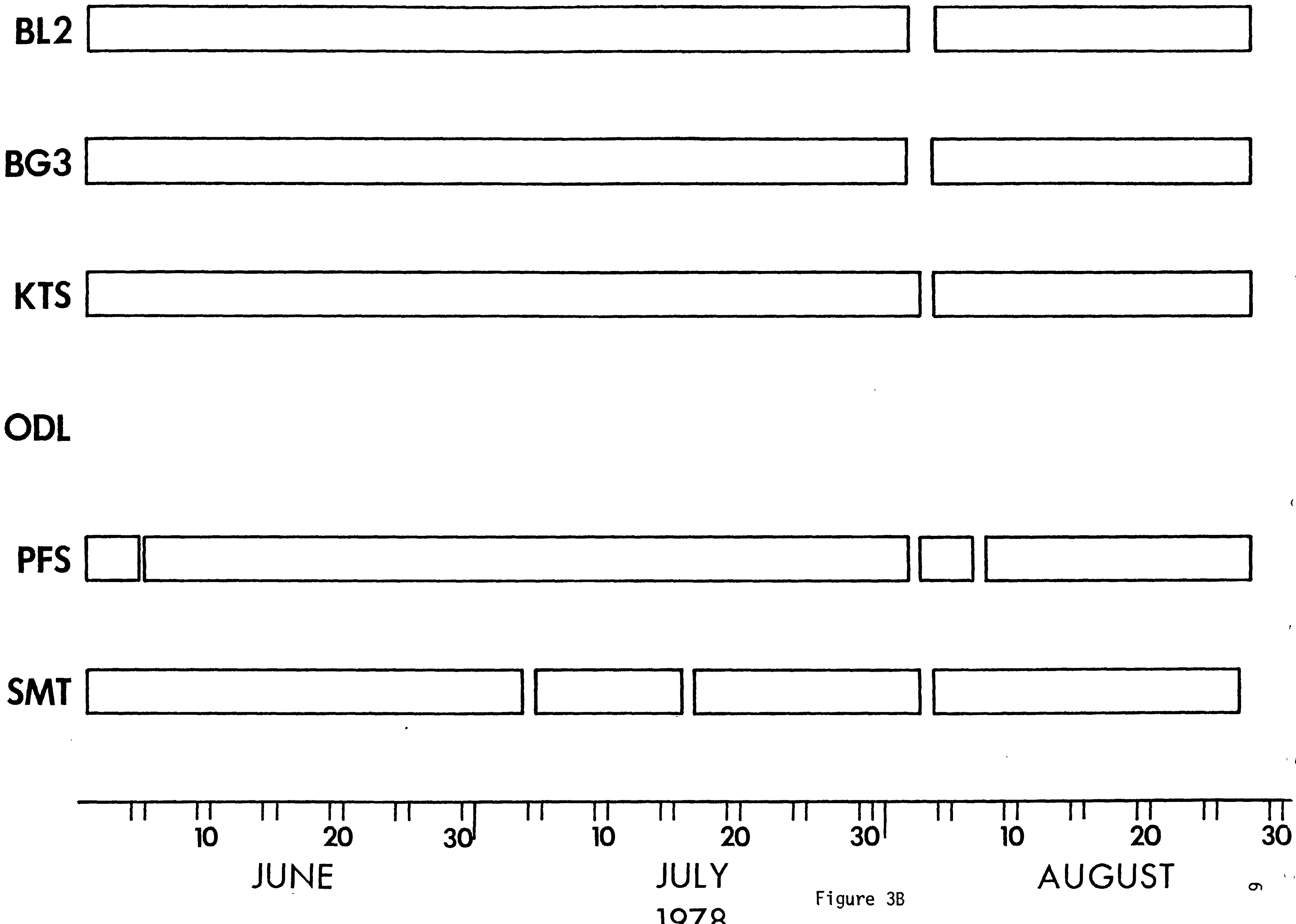

BL2
BG3
KTS
ODL
PFS
SMT
10
20
30
10
20
30
10
20
30
JUNE
JULY
AUGUST
1978

Figure 3B

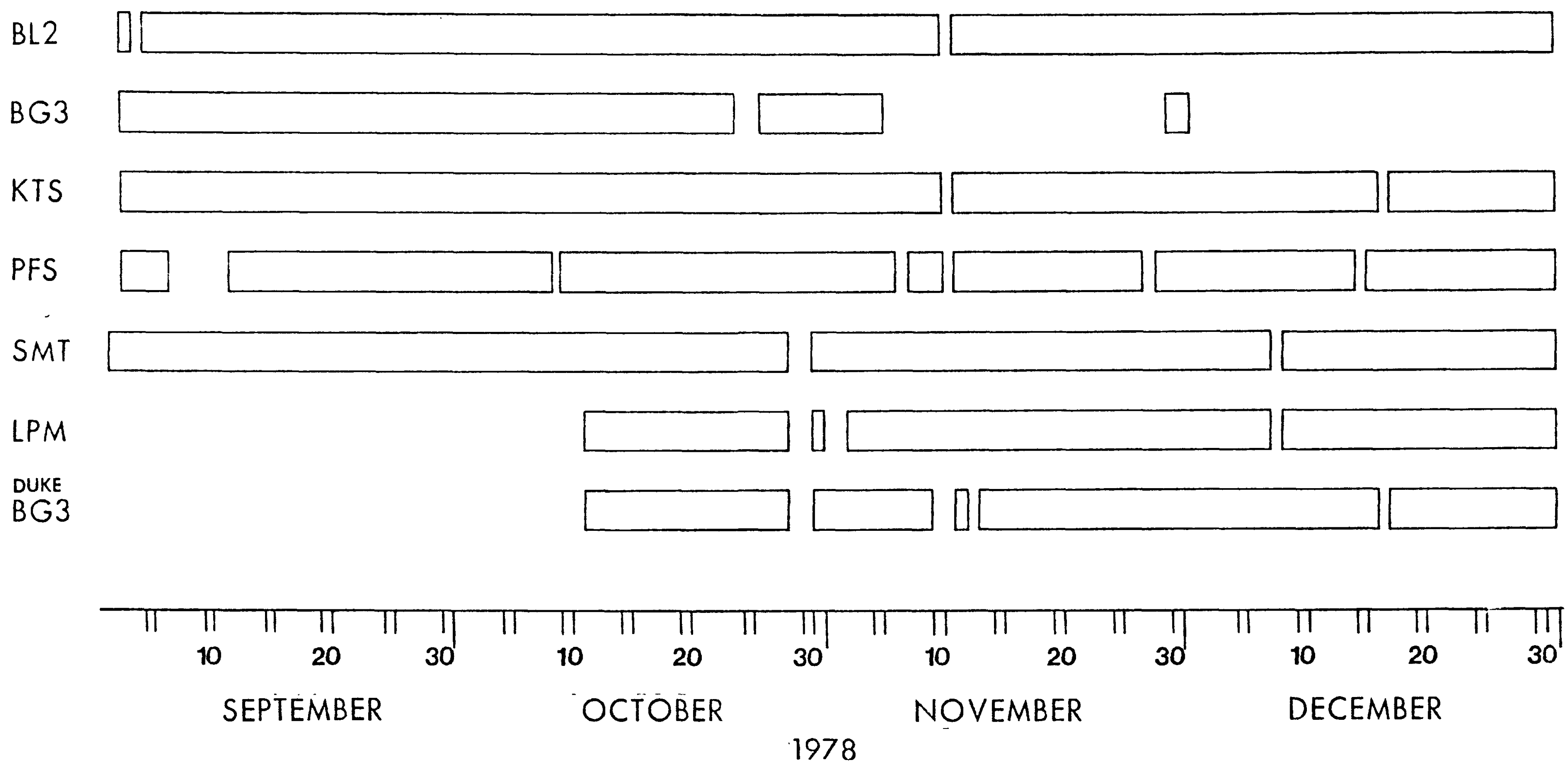
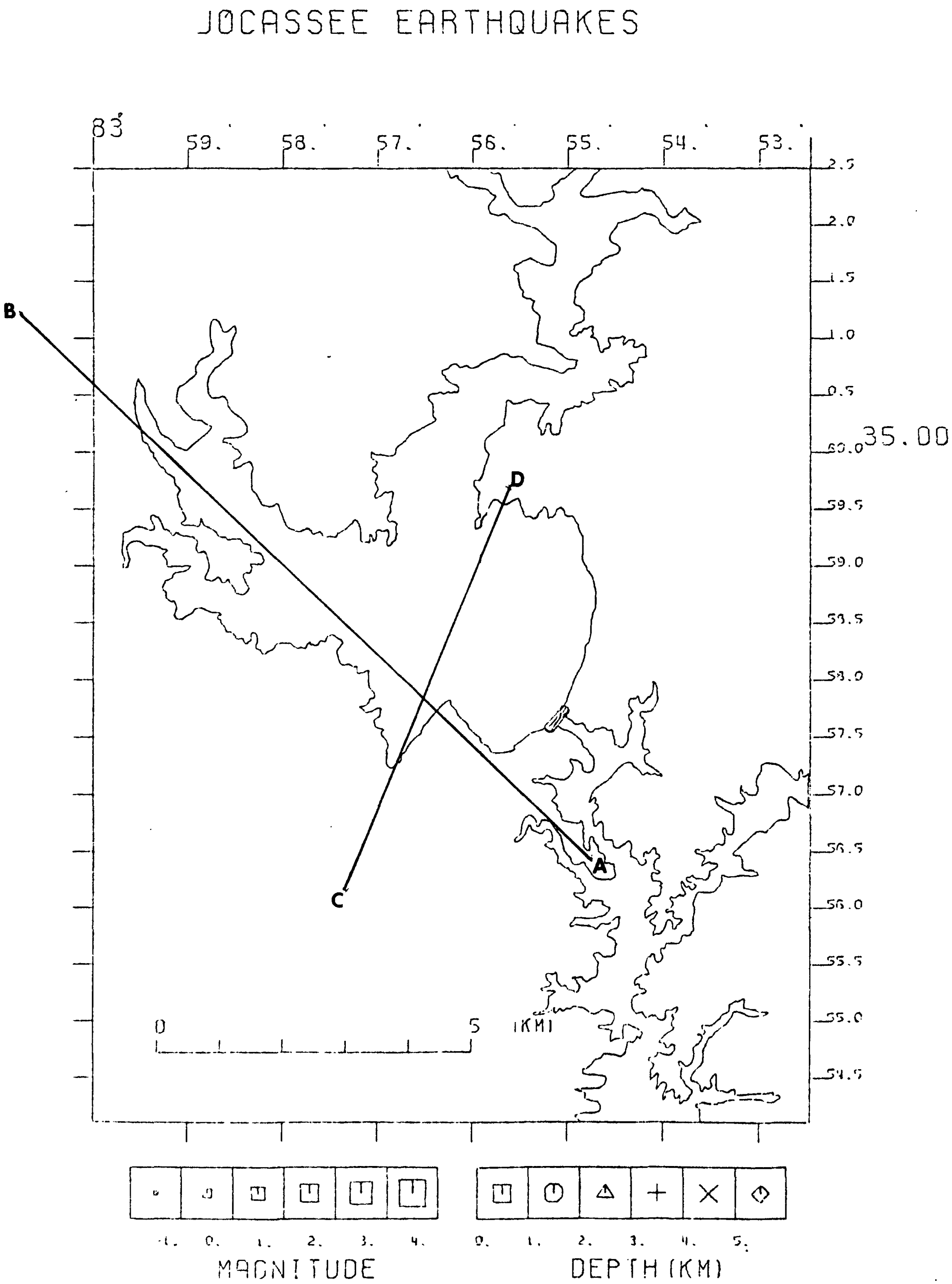

BL2
BG3
KTS
PFS
SMT
LPM
DUKE BG3
10
20
30
10
20
30
10
20
30
10
20
30
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
1978

Figure 3C



JOCASSEE EARTHQUAKES
83
59.
58.
57.
56.
55.
54.
53.
35.00
B
C
D
A
0
5
(KM)
MAGNITUDE
DEPTH (KM)

Figure 4

In the reporting period (April 1, 1978 - September 30, 1979) 252 events were recorded. Of these 208 were located. All recorded events are listed in Appendix III. The located events are presented in Appendix IV, and the best locations (RMS<0.1s; ERH, ERZ < 1 km) are plotted in Figures 5A to 5I. The magnitudes of the events are proportional to the symbol size and the depths, in one kilometer increments, are given by different symbols. Event locations have been plotted monthly from April 1978 - December 1978 (Figures 5A - 5I). In this period there were 30 events with $M_L \geq 1.0$ and these are listed in Table 1. Seismic activity throughout this nine month period was characterized by four to five events per week. All activity was confined to the immediate lake vicinity in areas of previously noted concentrations. One exception to this pattern is seen in May and September 1978 when a new cluster of activity developed in the northwest area of the lake (Figures 5B and 5F). This newest cluster seems to indicate a continued outward, slow migration of epicenters observed since the initial activity of 1975 - 1976. It was also observed that average depths had been increasing in areas of previous activity (1975 - 1976) in the southern, western, and northern clusters reinforcing our idea of three dimensional outward migration of hypocenters with time.

In January 1979 all portable seismographs were removed. Figure 6 presents locations obtained from three permanent stations, (BG3, SMT, LPM) from January 1979 to July 1979. In this period 11 events with $M_L \geq 1.0$ were recorded and they are listed in Table 2. It appears from Figure 6 that our detection threshold dropped after removal of the portable seismographs, but we believe only the location threshold was decreased. Station LPM is located to the extreme northwest section of the lake and many of the smaller

TABLE 1

LIST OF EVENTS $M_L > 1$

DATE ('78)	TIME (UCT) H:M	M_L
04:04	09:11	1.4
04:11	00:49	1.5
05:12	13:39	1.4
05:12	14:15	1.3
05:23	08:07	1.2
05:23	12:29	1.5
06:01	16:32	1.6
06:11	16:22	1.1
06:27	06:03	1.2
07:22	15:18	1.1
08:17	05:08	1.7
08:21	13:53	2.3
09:11	11:55	1.3
09:16	09:13	1.6
	16:36	1.6
09:21	07:08	2.3
09:22	23:16	1.8
09:23	18:03	1.4
09:26	01:09	1.6
	20:10	1.8
10:05	12:24	1.6
	12:31	2.1
10:17	11:42	1.0
	12:06	1.1

DATE ('78)	TIME (UCT) H:M	M_L
12:05	23:58	1.4
12:18	04:09	1.8
12:20	05:37	1.9
	05:50	1.2
	06:16	1.5
12:24	15:45	1.0

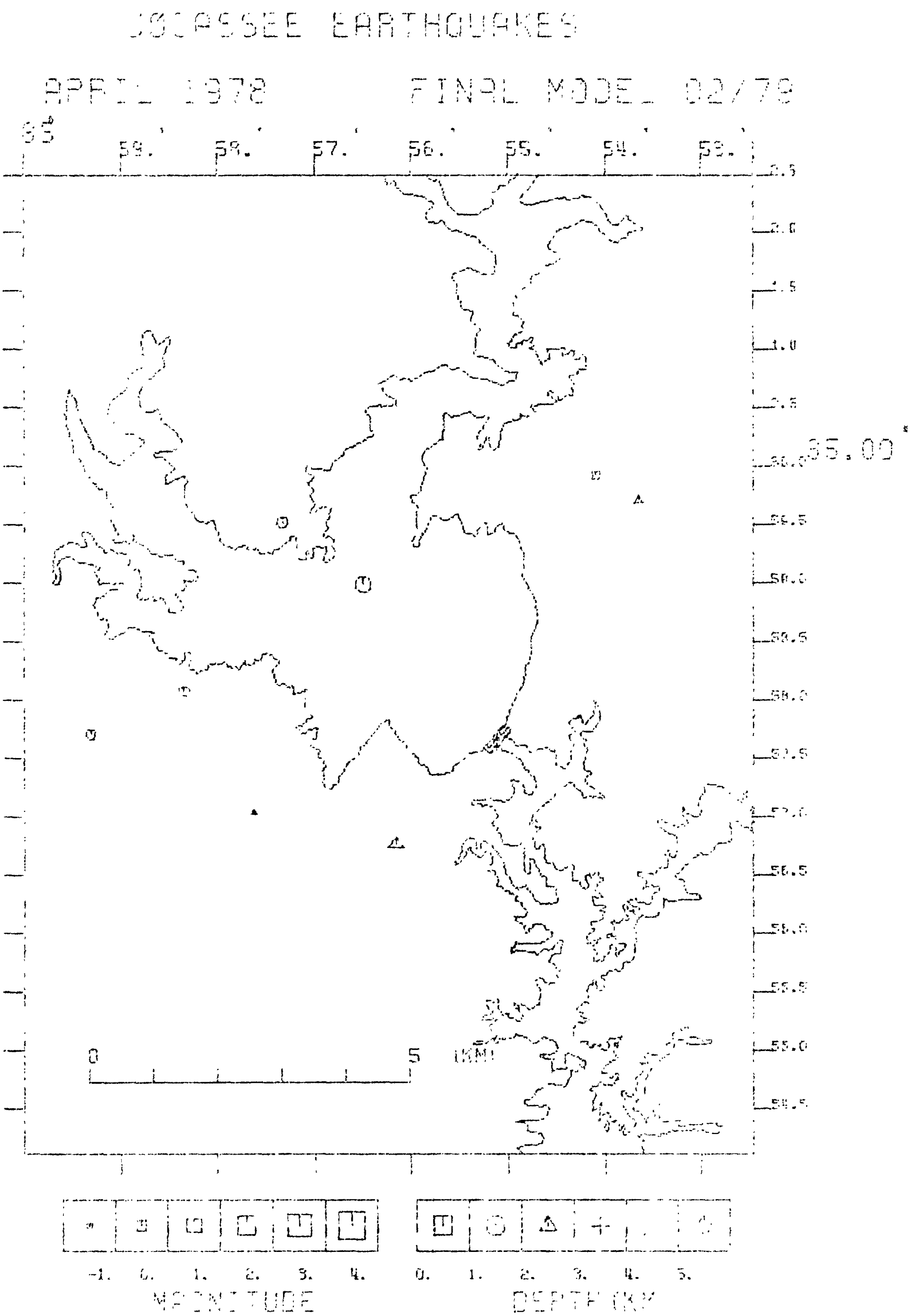

JOCASSEE EARTHQUAKES
APRIL 1978 FINAL MODEL 02/79
35.00
0 5 (KM)
-1. 0. 1. 2. 3. 4.
MAGNITUDE
0. 1. 2. 3. 4. 5.
DEPTH (KM)

Figure 5A

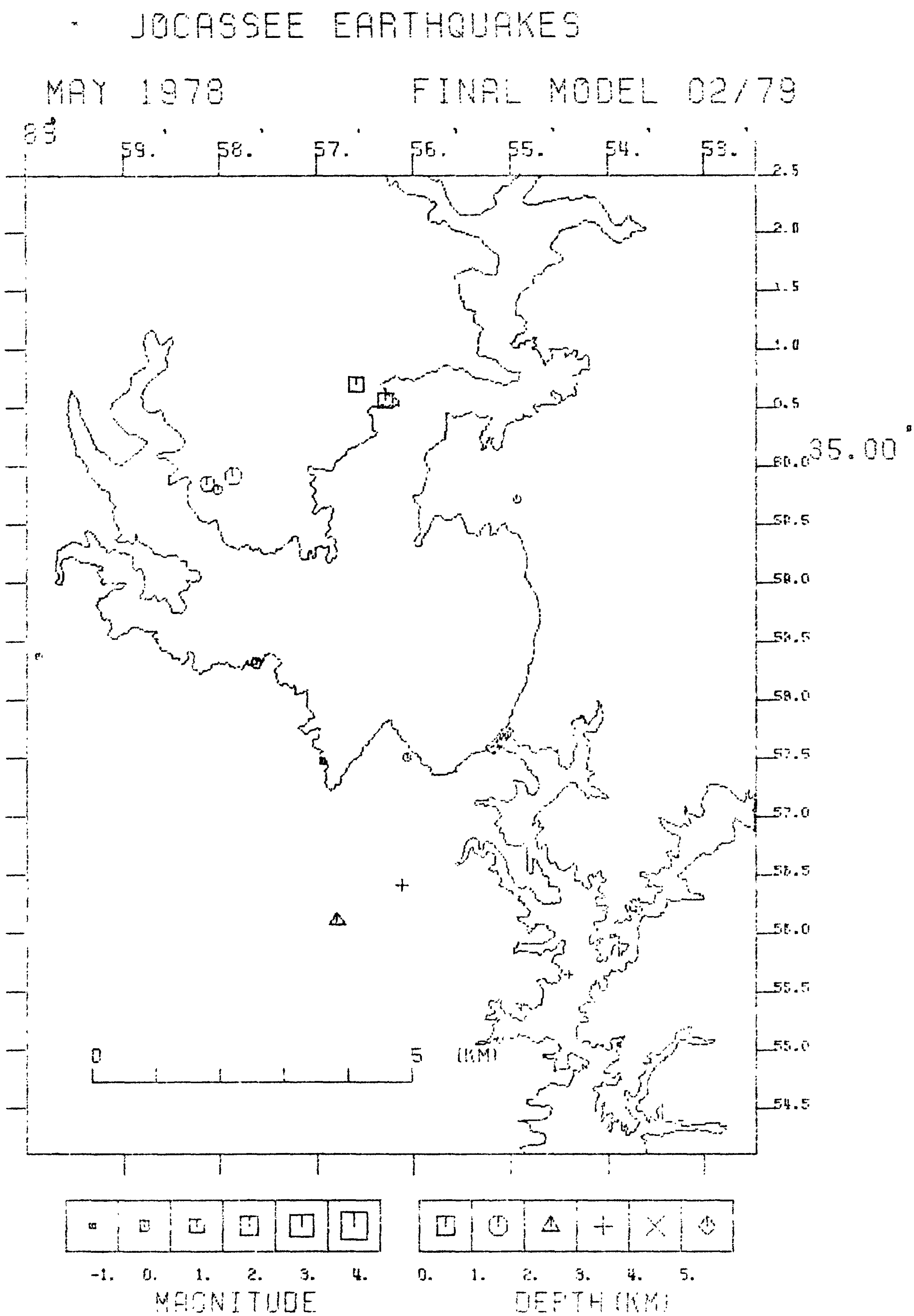

JOCASSEE EARTHQUAKES
MAY 1978
FINAL MODEL 02/79
83
59.
58.
57.
56.
55.
54.
53.
35.00
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 5B

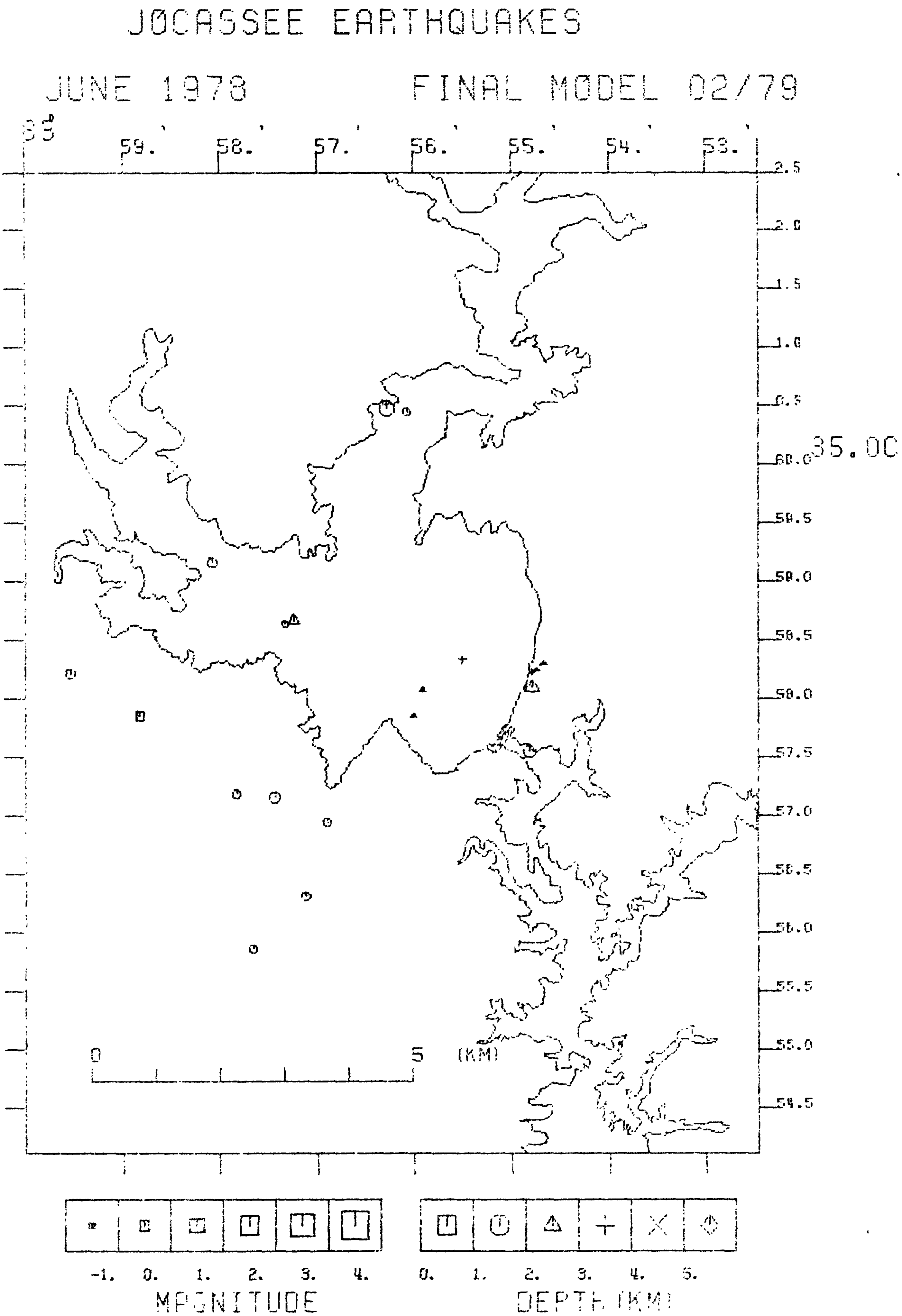

JØCASSEE EARTHQUAKES
JUNE 1978
FINAL MØDEL 02/79
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH(KM)

Figure 5C

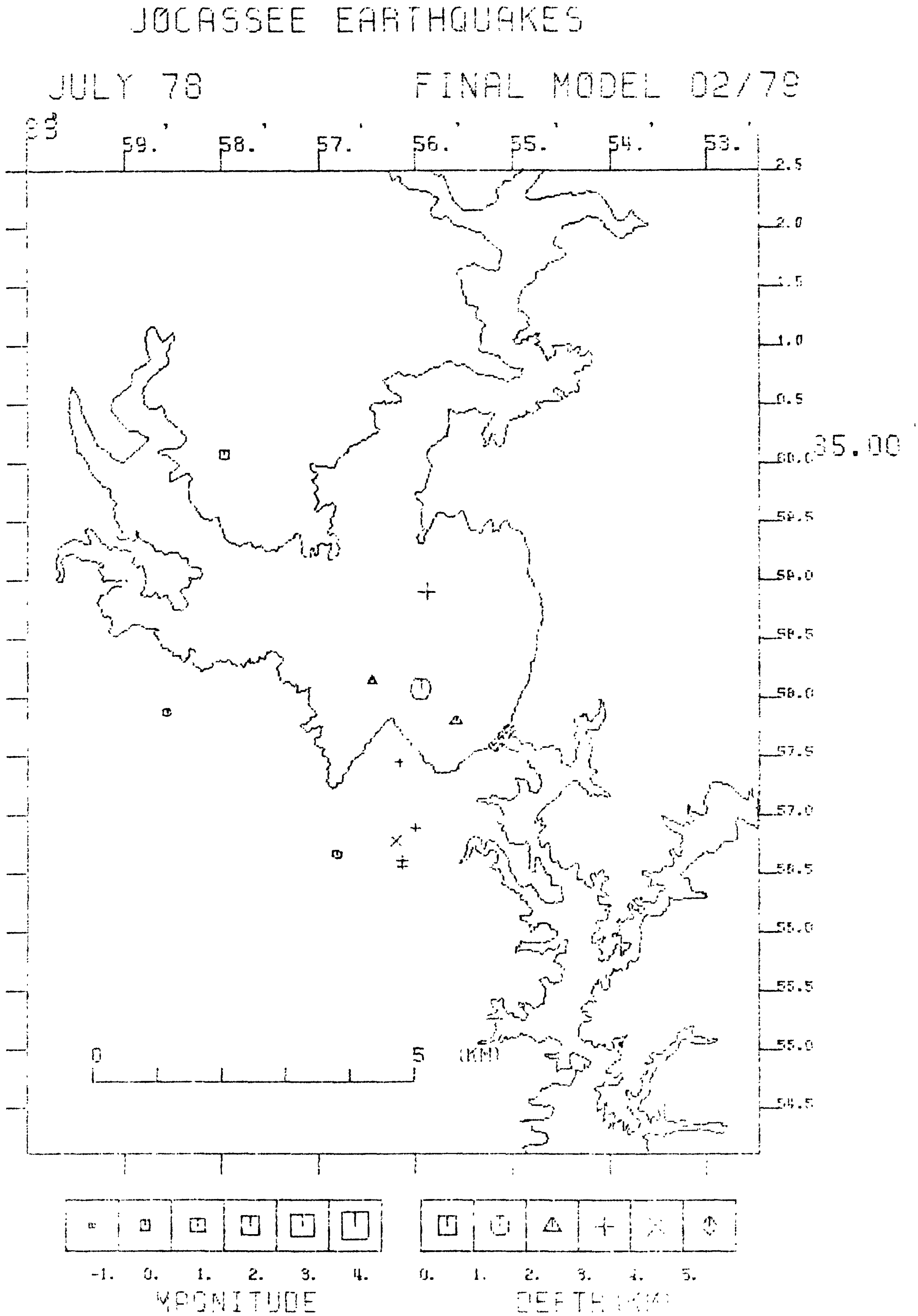

JØCASSEE EARTHQUAKES
JULY 78
FINAL MODEL 02/79
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.0
0.5
35.00
58.5
58.0
57.5
57.0
56.5
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1.
2.
3.
4.
0.
1.
2.
3.
4.
5.
MAGNITUDE
DEPTH (KM)

Figure 5D

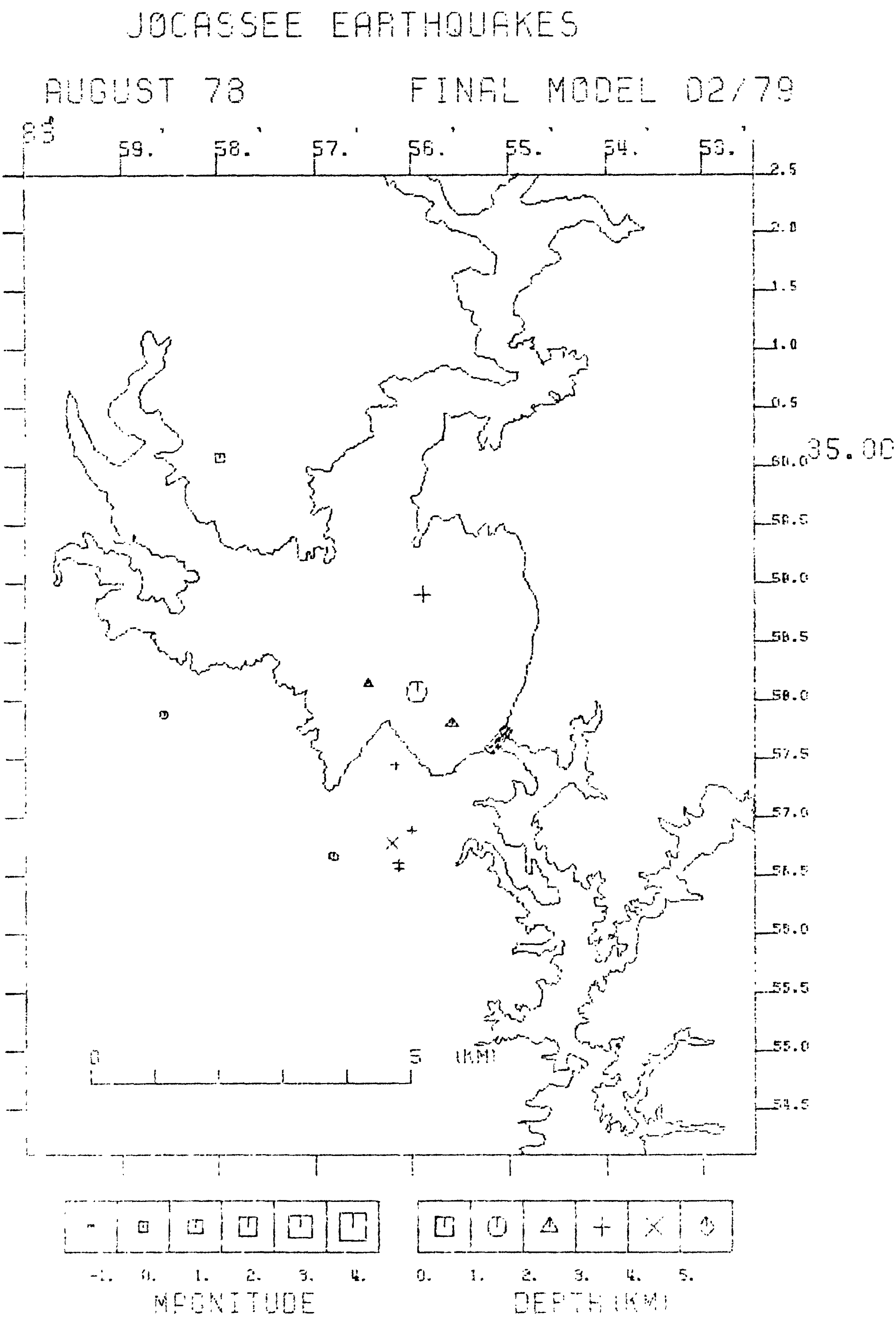

JØCASSEE EARTHQUAKES
AUGUST 78
FINAL MODEL 02/79
59.
58.
57.
56.
55.
54.
53.
35.00
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 5E

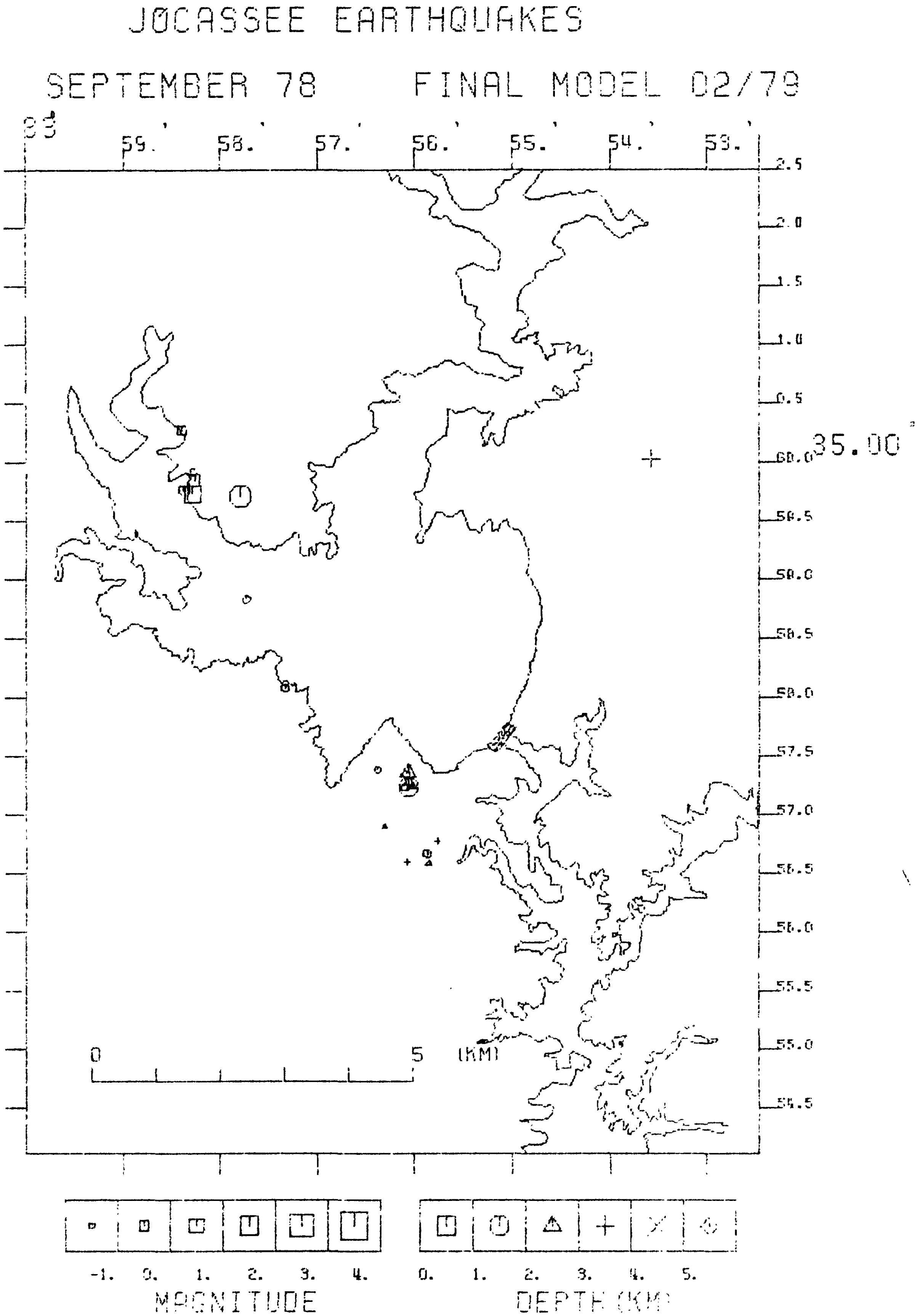

JØCASSEE EARTHQUAKES
SEPTEMBER 78 FINAL MODEL 02/79
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 5F

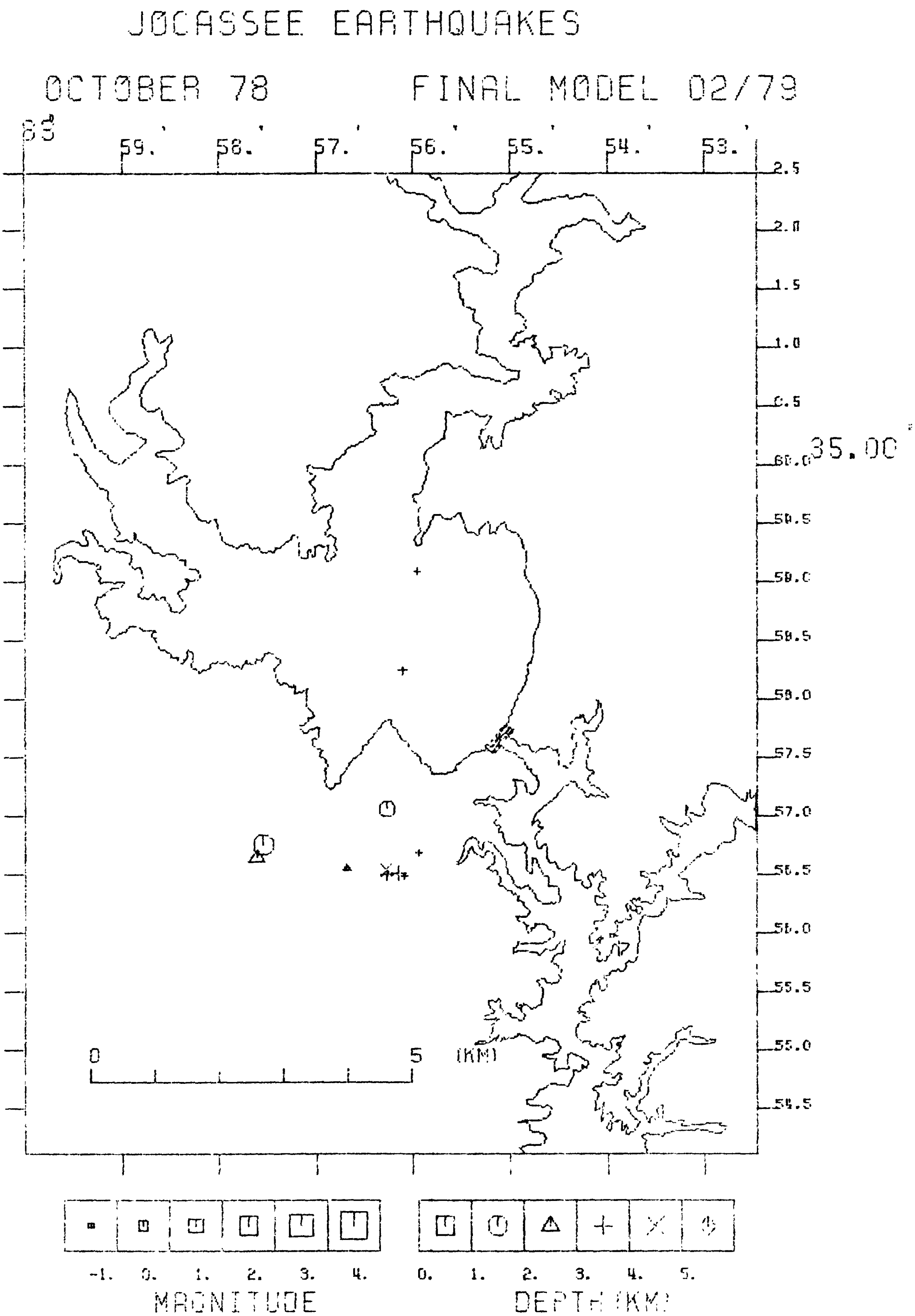

JOCASSEE EARTHQUAKES
OCTOBER 78
FINAL MODEL 02/79
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 5G

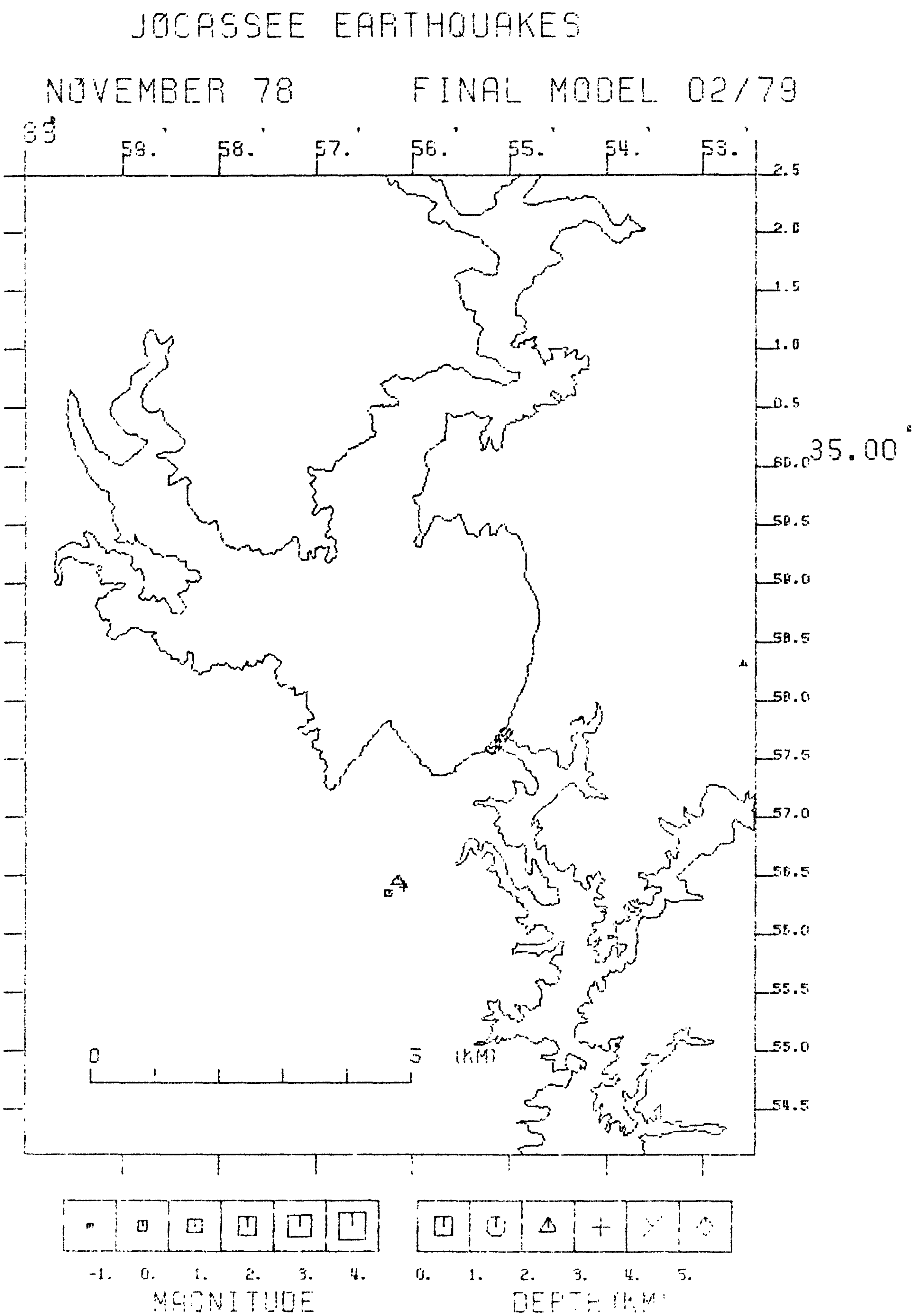

JØCASSEE EARTHQUAKES
NØVEMBER 78
FINAL MODEL 02/79
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.

Figure 5H

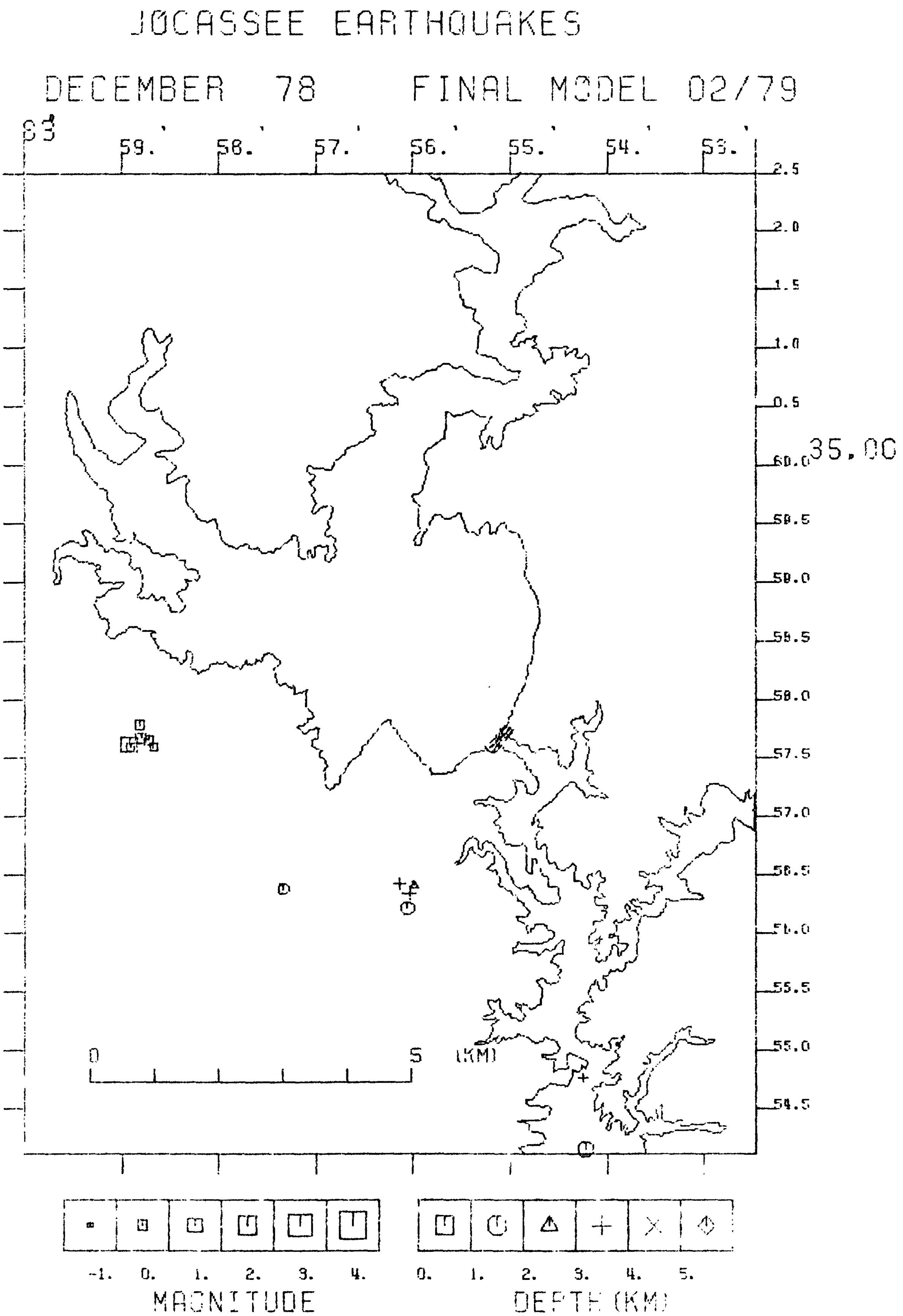
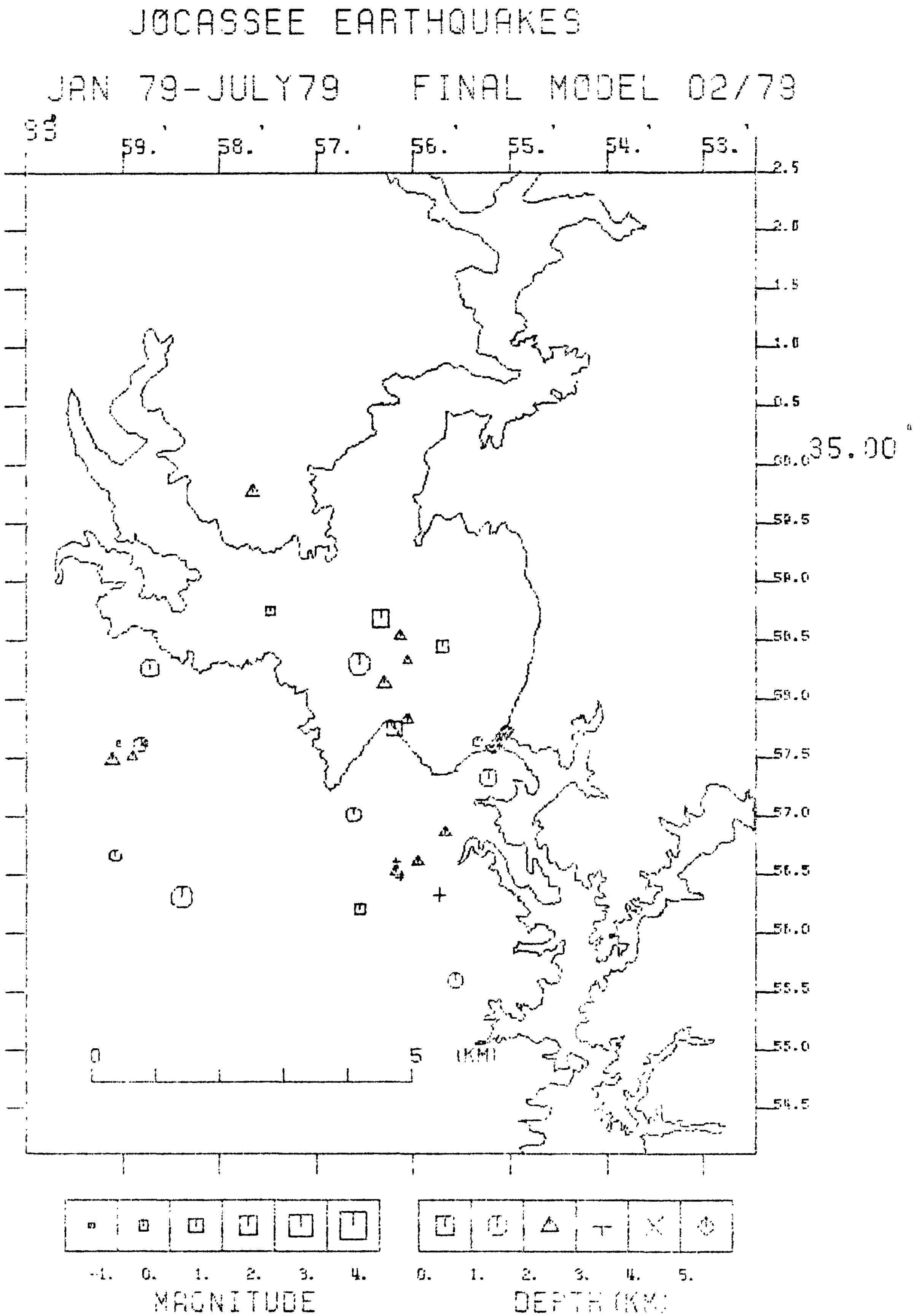

JØCASSEE EARTHQUAKES
DECEMBER 78 FINAL MODEL 02/79
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 5I



JØCASSEE EARTHQUAKES
JAN 79-JULY79 FINAL MØDEL 02/79
59.
58.
57.
56.
55.
54.
53.
35.00
0
5
(KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 6

TABLE 2

LIST OF EVENTS $M_L > 1$

DATE ('79)	TIME (UCT) H:M	M_L
02:05	18:53	1.4
02:13	15:07	1.7
03:20	14:18	1.54
04:27	22:59	1.52
04:28	05:07	1.27
05:01	20:39	2.45
05:28	11:45	2.49
07:08	09:51	1.32
07:17	02:12	1.72
	05:47	1.00
07:20	14:24	1.00
08:01	16:49	1.16
08:26	01:31	3.7

events are not recorded there. SMT and BG3, on the otherhand, record the smallest of events. Comparing these seven months with previous months' activity, the numbers of events continues to be four to five per week. A separate location plot for August and September will be found in Section III of this report where the August 25 $M_L \sim 3.7$ is discussed in detail. Cumulative activity for April 1978 - September 1979 is shown in Figure 7, while the total cumulative seismicity (Nov. 1975 - Sept. 1979) is presented in Figure 8.

II.3. *Water Level and Seismicity*

In Figures 9A through 9E the seismicity is compared with Lake Jocassee water levels and their fluctuations. These data are plotted on the same time axis for the five periods, March - May 1978, June - August 1978, September - December 1978, January - May 1979, and June - September 1979. Starting at the top are the daily water level readings at 8 AM (Local time). The bars indicate the maximum and minimum water level for that day. In the ordinate, 100 feet corresponds to a full pond elevation of 1100 feet above sea level. The daily variation of water level (computed for readings at 8 AM and plotted midway between them) is shown on the next row. The daily energy release and the number of events are shown in the two bottom rows. On this time scale there appears to be no obvious correlation between seismicity and water level or its fluctuations. However, when we consider the lake levels over a longer period, we observed definite associations. These are discussed in the next section.

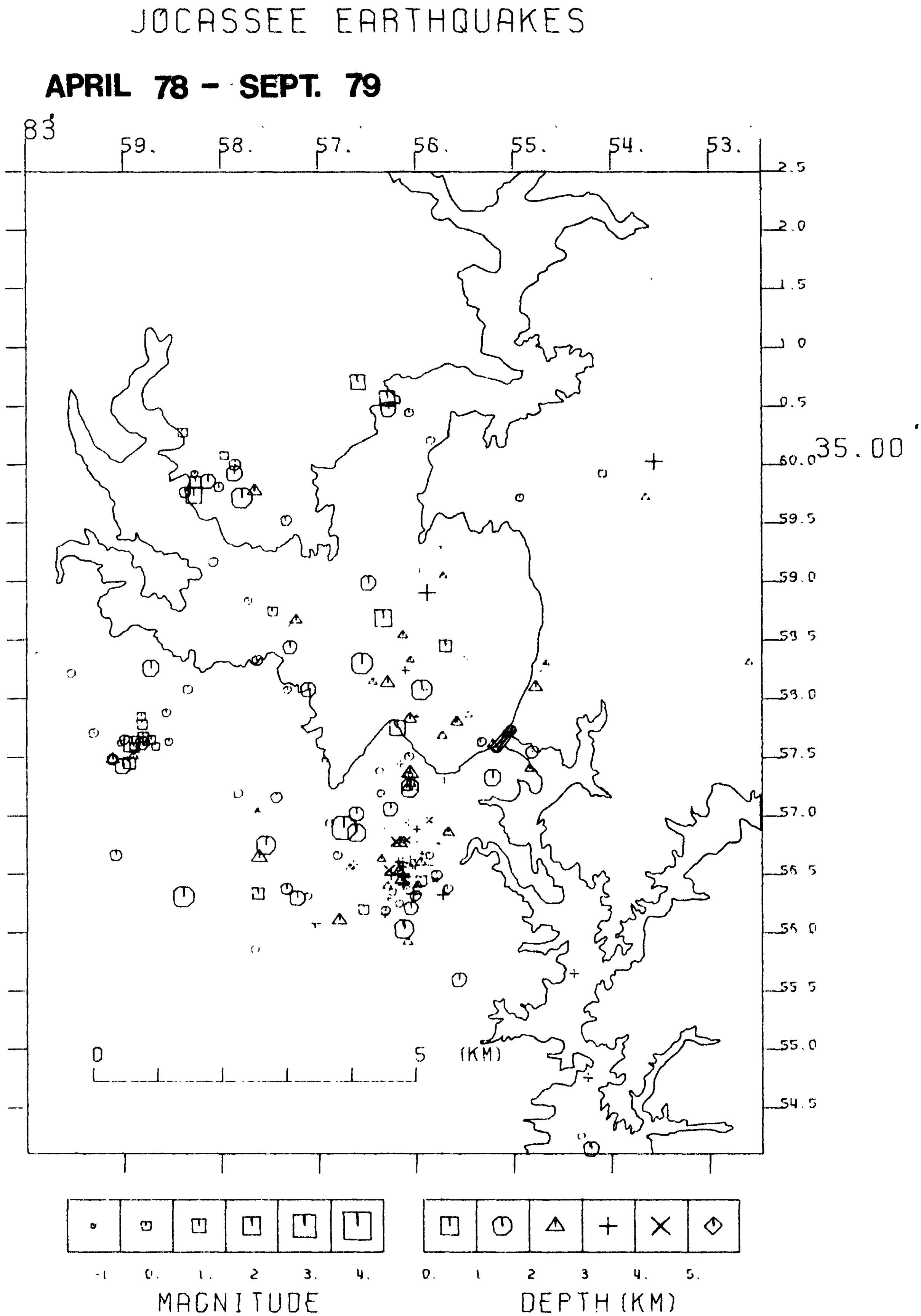
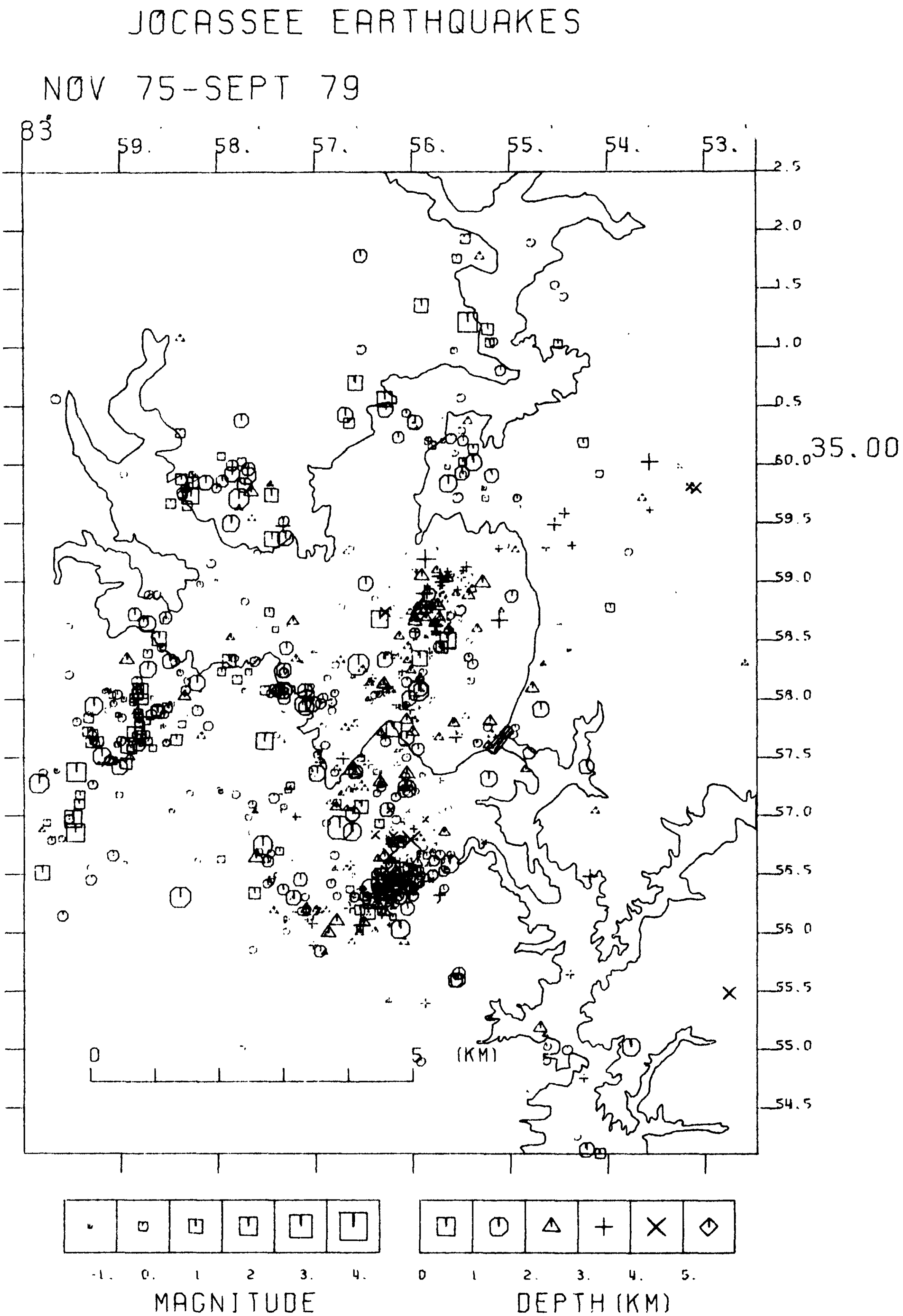

JØCASSEE EARTHQUAKES
APRIL 78 - SEPT. 79
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1
0.
1.
2
3.
4.
MAGNITUDE
0.
1
2
3
4.
5.
DEPTH (KM)

Figure 7



JOCASSEE EARTHQUAKES
NOV 75-SEPT 79
83°
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00°
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5
(KM)
-1.
0.
1
2
3.
4.
MAGNITUDE
0
1
2.
3.
4.
5.
DEPTH (KM)

Figure 8

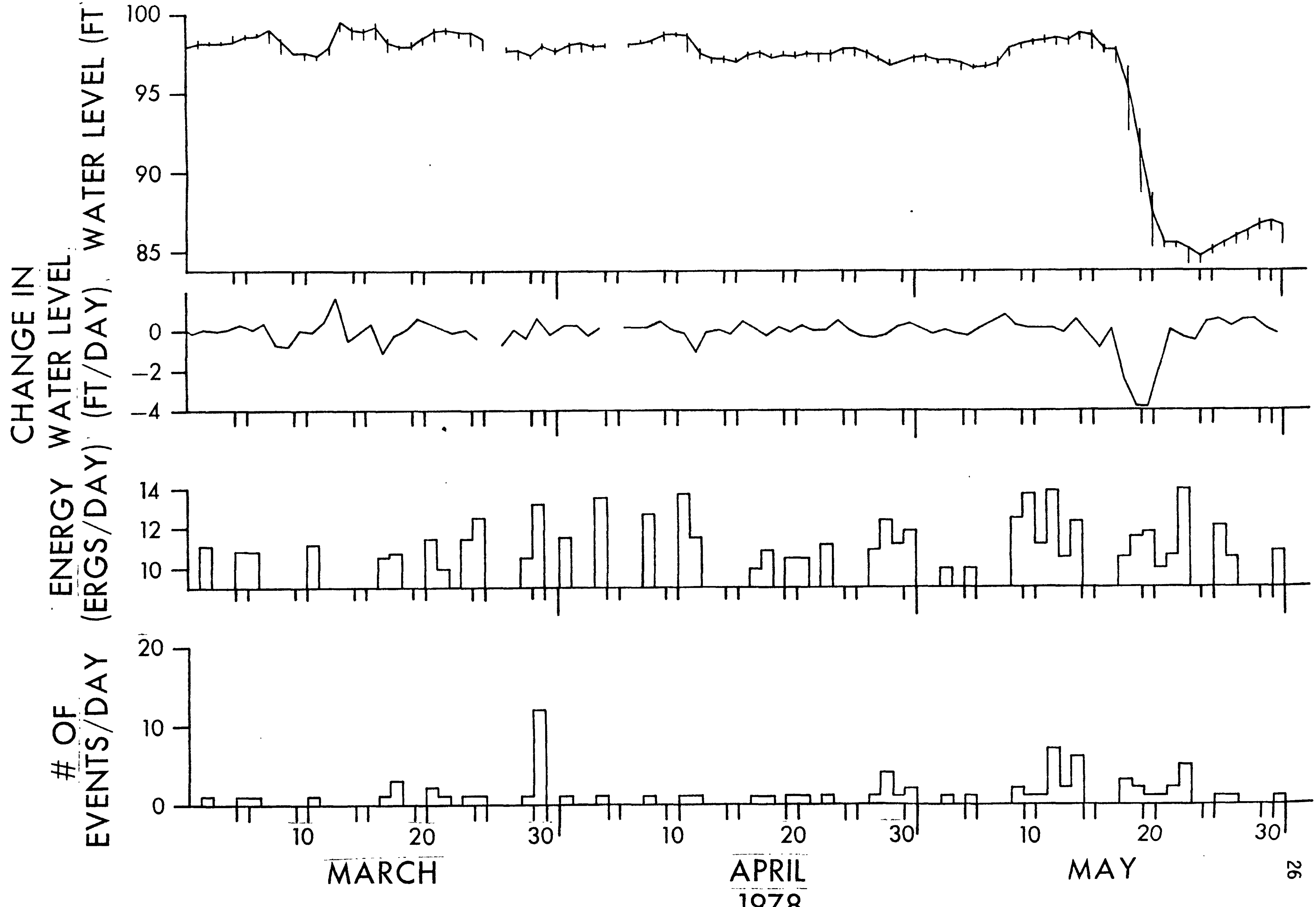
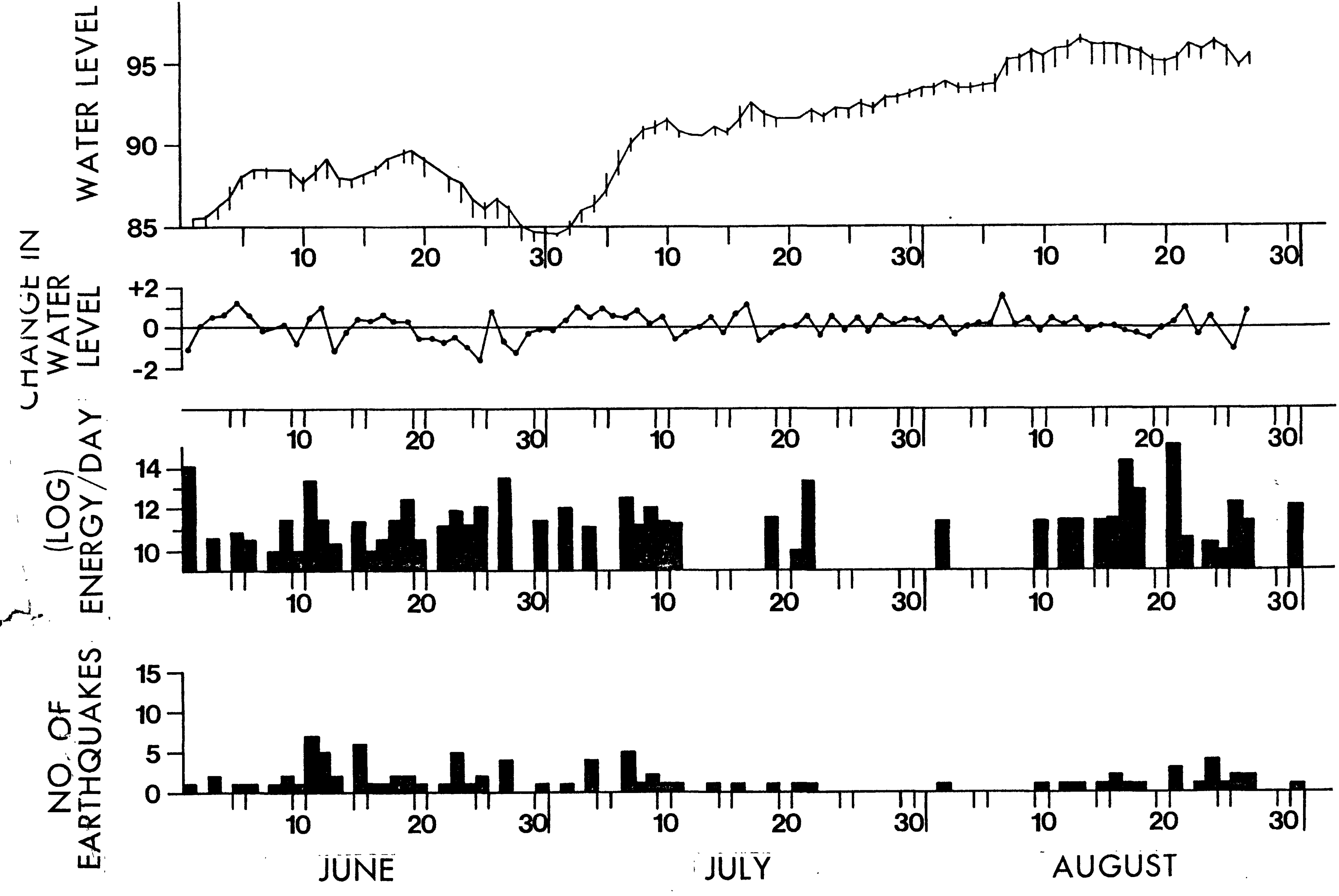

WATER LEVEL (FT
100
95
90
85
CHANGE IN WATER LEVEL (FT/DAY)
0
−2
−4
ENERGY (ERGS/DAY)
14
12
10
OF EVENTS/DAY
20
10
0
10
20
30
10
20
30
10
20
30
MARCH
APRIL
1978
MAY

Figure 9A



WATER LEVEL
95
90
85
CHANGE IN WATER LEVEL
+2
0
-2
(LOG) ENERGY/DAY
14
12
10
NO. OF EARTHQUAKES
15
10
5
0
10
20
30
JUNE
JULY
AUGUST
1978

Figure 9B

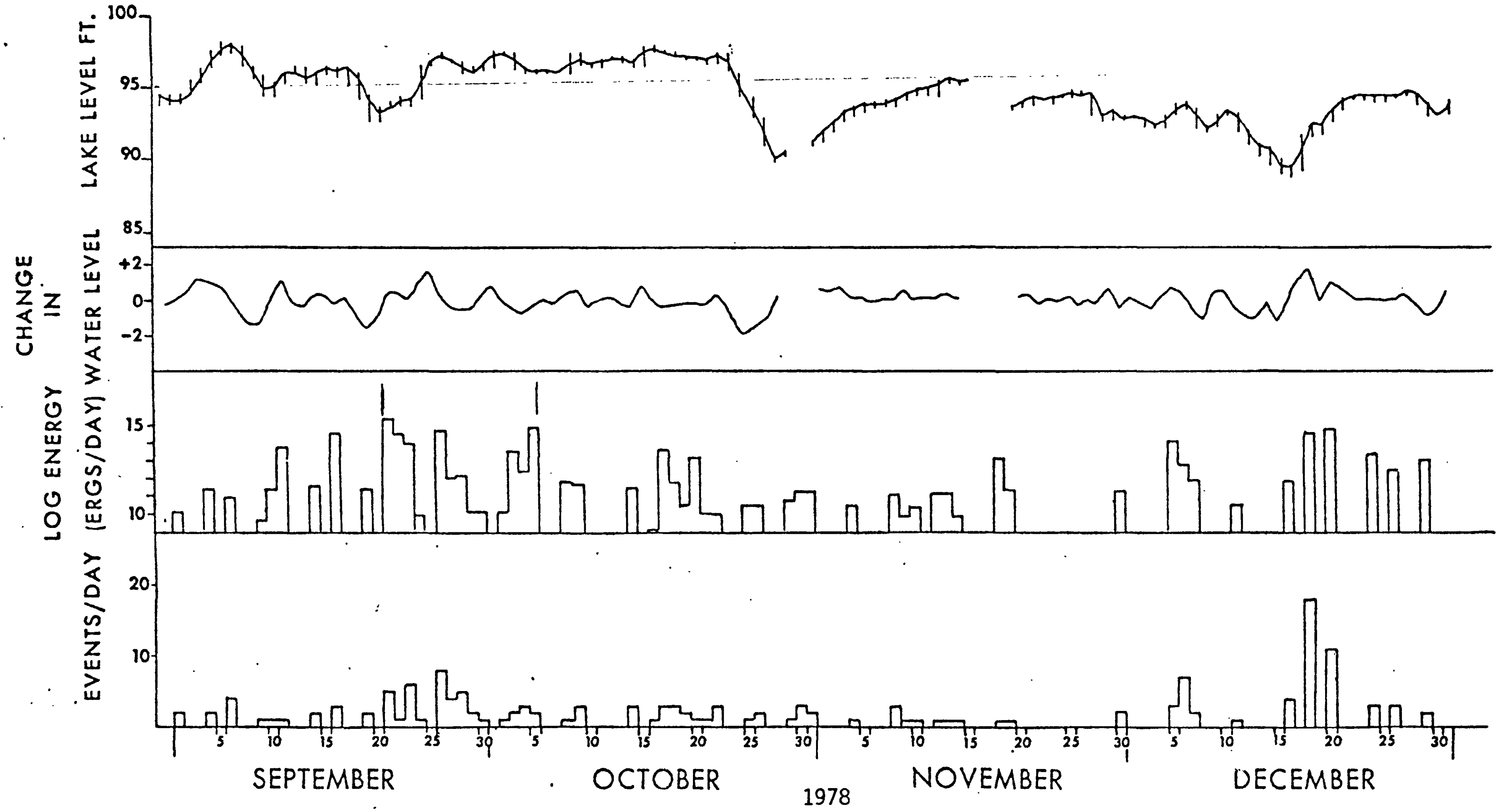

LAKE LEVEL FT.
100
95
90
85
CHANGE IN WATER LEVEL
+2
0
-2
LOG ENERGY (ERGS/DAY)
15
10
EVENTS/DAY
20
10
5
10
15
20
25
30
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
1978

Figure 9C

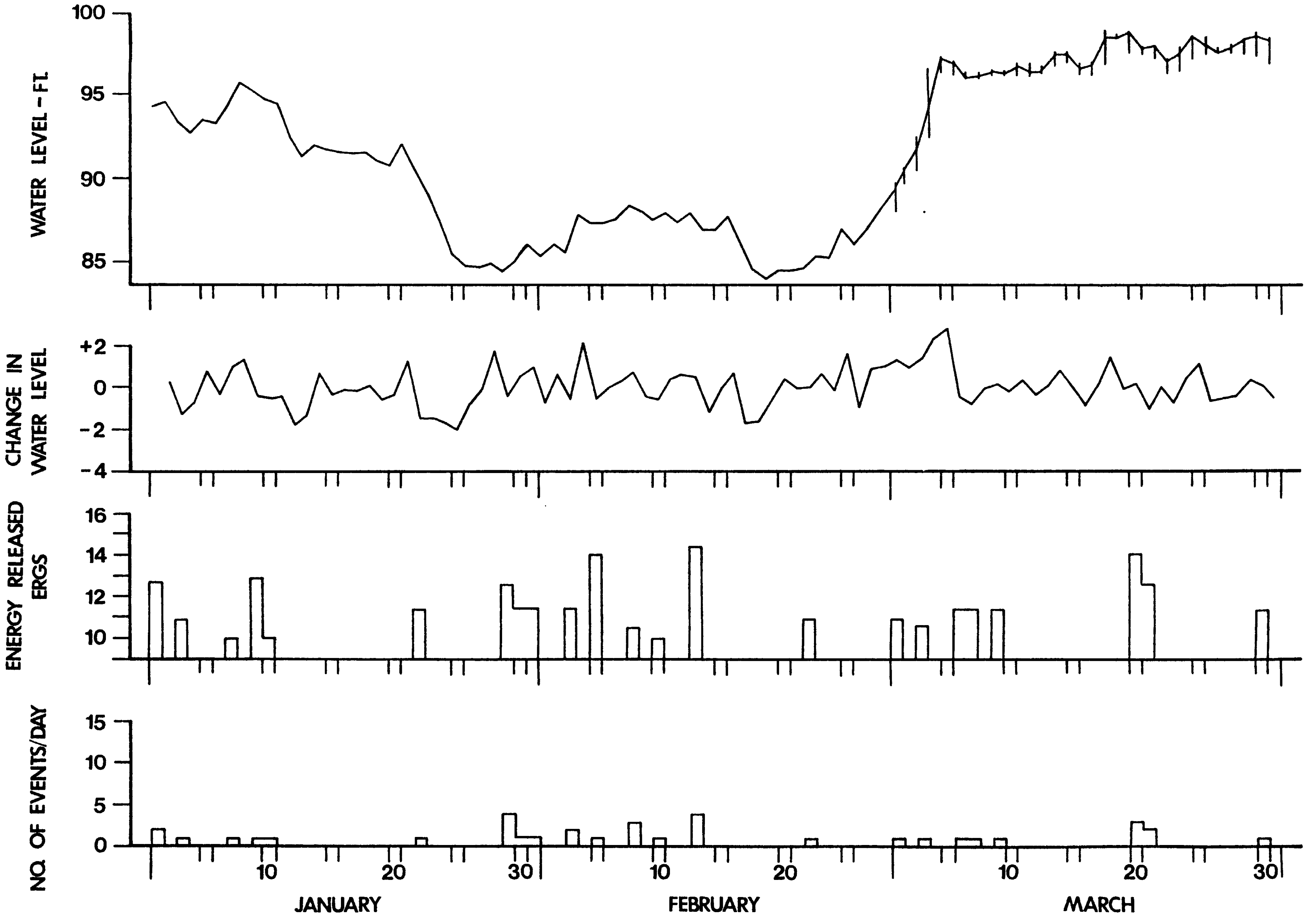

WATER LEVEL - FT.
100
95
90
85
CHANGE IN WATER LEVEL
+2
0
-2
-4
ENERGY RELEASED ERGS
16
14
12
10
NO. OF EVENTS/DAY
15
10
5
0
10
20
30
10
20
10
20
30
JANUARY
FEBRUARY
MARCH
1979

Figure 9D

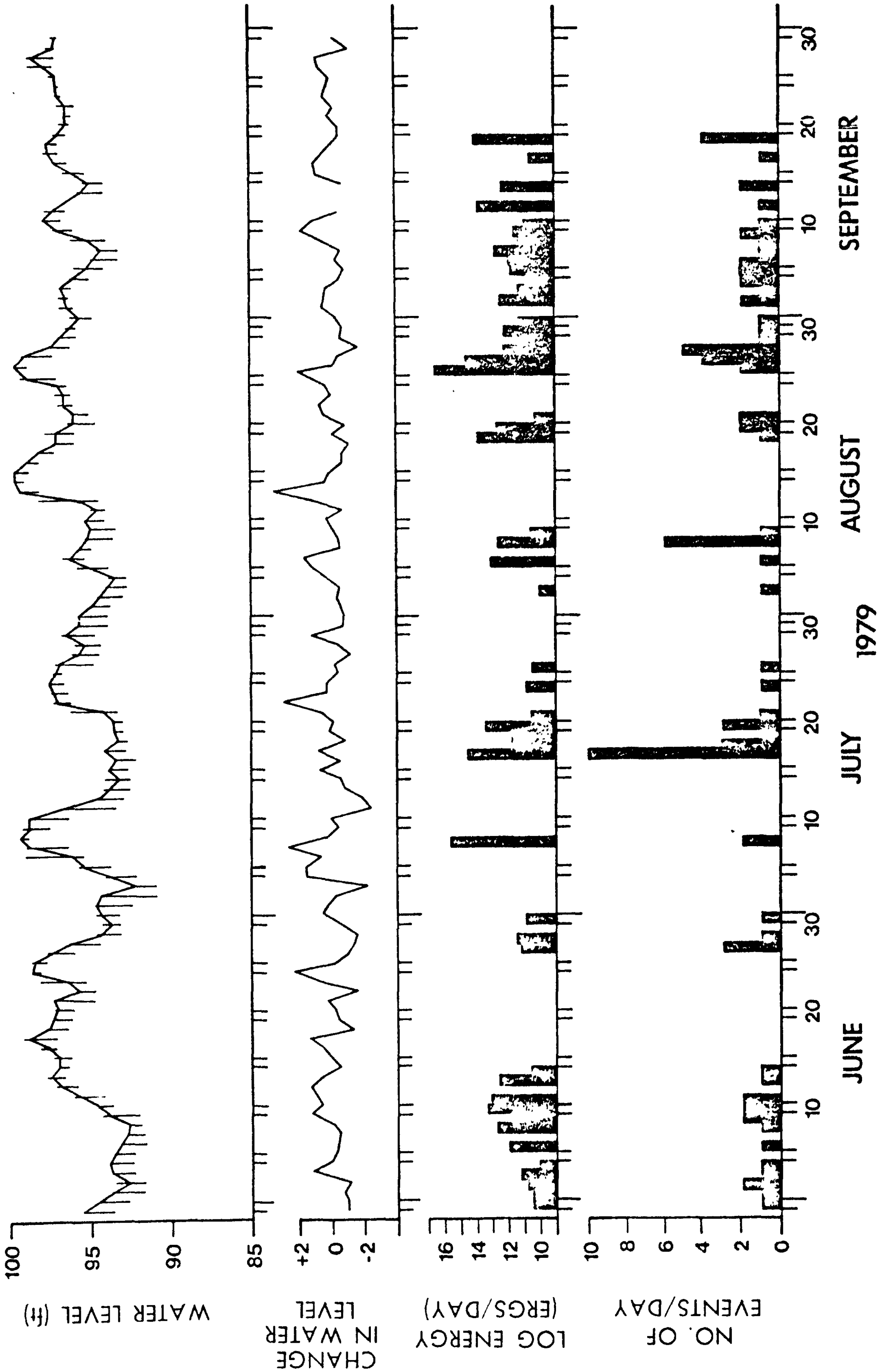

WATER LEVEL (ft)
CHANGE IN WATER LEVEL
LOG ENERGY (ERGS/DAY)
NO. OF EVENTS/DAY
JUNE
JULY
1979
AUGUST
SEPTEMBER

Figure 9E

III. AUGUST 25, 1979 JOCASSEE EARTHQUAKE

III.1. *Introduction*

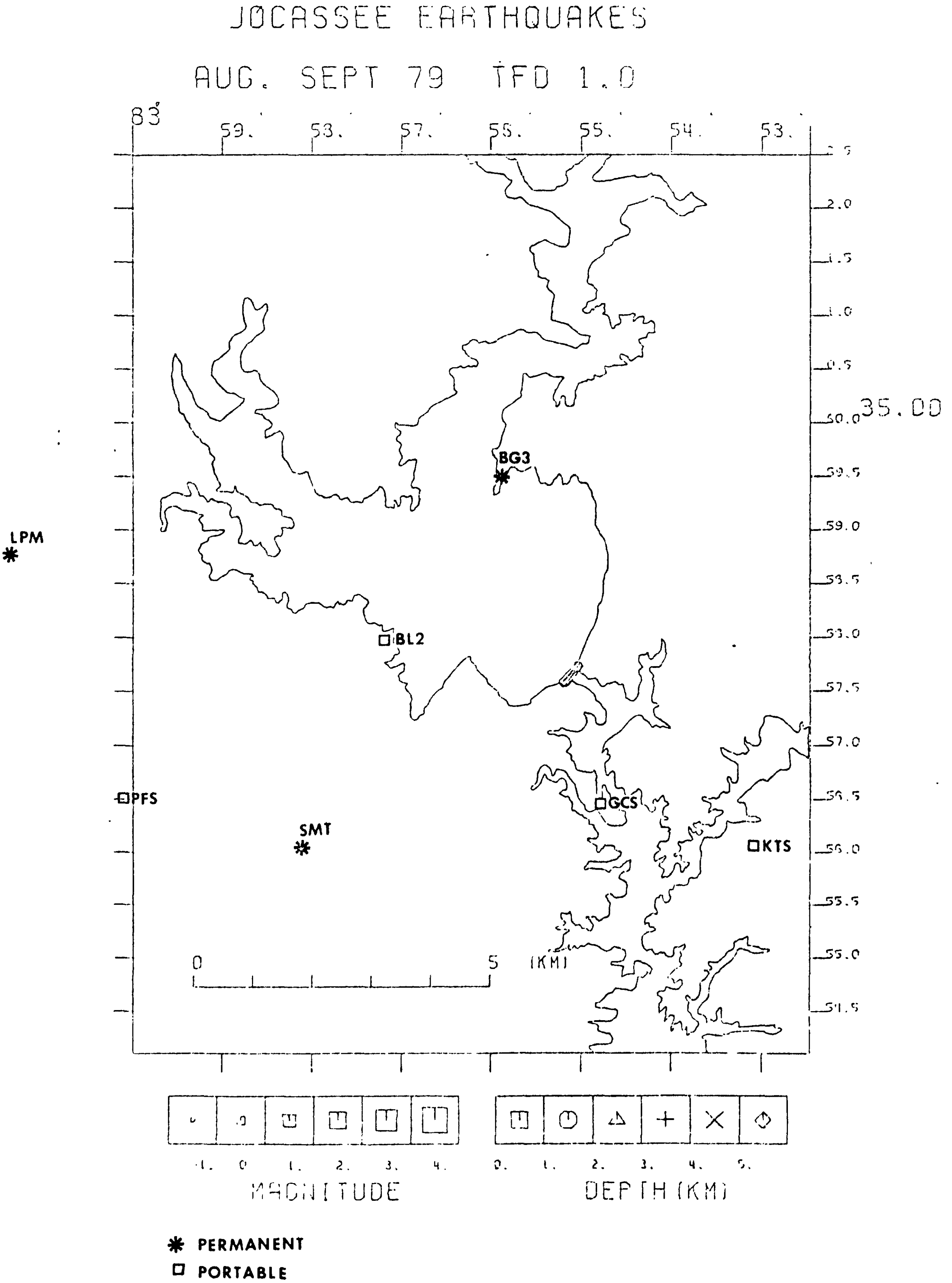
On August 25, 1979 (9:31 PM EDST, August 26, 01.31 UCT) a magnitude 3.7 (M_{bLg}, BLA) earthquake occurred in the vicinity of Lake Jocassee, South Carolina. This MM intensity VI event was felt in an area of about 15,000 sq. km and was recorded locally on the three station Lake Jocassee seismographic network, and regionally on seismic stations in South Carolina, North Carolina, Georgia, Tennessee and Virginia. Within 24 hours of the event we deployed four Sprengnether MEQ 800 portable seismographs in the epicentral area. This report presents an analysis of seismic data recorded in the 20 day period following that initial event of August 25. During this period (August 26, 1979 - September 15, 1979) 26 aftershocks were recorded and they ranged in magnitude from -.60 to 2.0.

III.2. *Instrumentation*

The main shock of August 25 was recorded on 3 permanent seismic stations in the immediate vicinity of Lake Jocassee. All aftershocks were recorded on four additional portable seismographs which were deployed on August 26, 1979. The station locations are shown in Figure 10.

III.3. *Results*

In the reporting period 26 locatable events were recorded (Appendix IV). Figure 11 shows location of the main event on August 25 and aftershocks. Most of the activity occurred in a group approximately 1 km south of the lake and about 3 km from the dam.



JOCASSEE EARTHQUAKES
AUG. SEPT 79 TFD 1.0
83°
59.
58.
57.
56.
55.
54.
53.
35.00
BG3
LPM
BL2
PFS
SMT
GCS
KTS
0
5 (KM)
-1. 0 1. 2. 3. 4.
MAGNITUDE
0. 1. 2. 3. 4. 5.
DEPTH (KM)
PERMANENT
PORTABLE

Figure 10

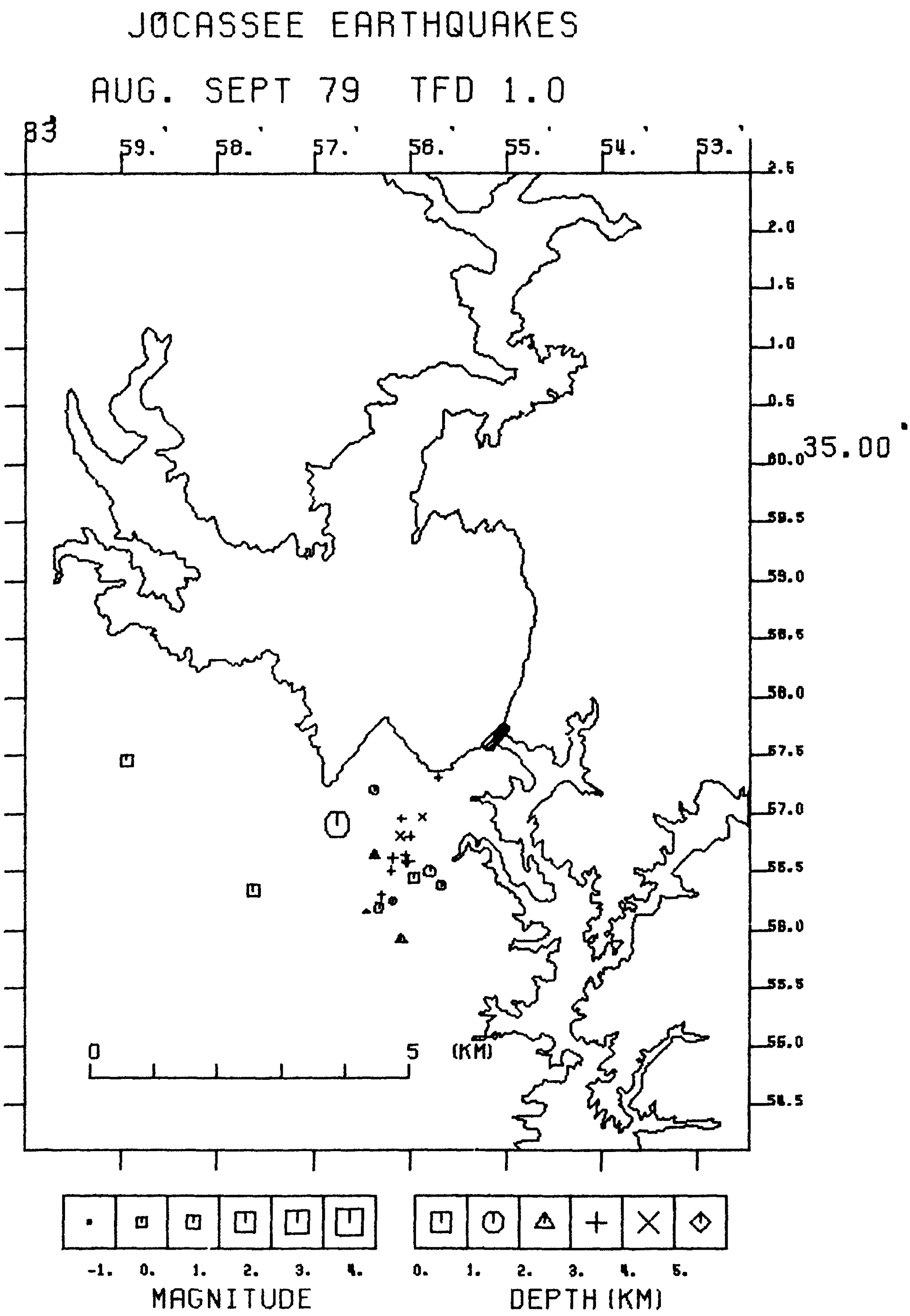

JØCASSEE EARTHQUAKES
AUG. SEPT 79 TFD 1.0
83
59.
58.
57.
56.
55.
54.
53.
2.5
2.0
1.5
1.0
0.5
60.0
35.00
59.5
59.0
58.5
58.0
57.5
57.0
56.5
56.0
55.5
55.0
54.5
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 11

III.4. *Location and Magnitude of Main Shock*

The initial location of the main shock (listed in AppendixIV) was obtained by using HYPO71 (Lee and Lahr, 1972) and a trial depth of 1 km, using only P-wave first arrival times at the three stations. (S wave arrivals could not be used as the various arrivals were clipped). Using only 3 arrival times is inadequate to obtain the correct depth, and the computer location was obtained with the depth fixed a 1 km. However the depths of most of the aftershocks (obtained by using both P and S phases) ranged from 2 to 4 km. This suggested that the depth of the main shock was also in that range. The main event was then relocated with trial depths of 2 and 3 km (Table 3).

In view of the depth of the aftershocks and the quality of the computer solution for the three trial focal depths (TFD) we suggest that a TFD = 2 km gives the best solution.

The main event was assigned a magnitude 3.6 by NEIS, whereas a M_{bLg} 3.7 was assigned by Dr. Bollinger--based on data from BLA and other stations of the VPI seismographic network. This event also provided a check on the local magnitude scale that we had been using at Lake Jocassee. According to that, the magnitude of this event was 3.1. The scale is being revised now.

TABLE 3

Trial Focal Depth (KM)	Origin Time 01h 31m	Lat N (34^o)	Long W (82^o)	Depth (km)
1	46.66'	56.89'	56.64'	1.0
2	46.59'	56;69'	56.36'	2.0
3	46.51'	56.57'	56.26'	3.0

III.5. *Fault Plane Solution*

Through the courtesy of various seismograph networks in the southeast we obtained first motion data for 54 stations. Though many of them were from small networks, they provided a good spatial coverage and also a check on the polarities of some stations by the available redundancy. These data indicated that the polarities of the Carolina Power and Light (CPL) and Bowman mininetworks are reversed. On checking the first arrivals of various teleseisms it appears that CHF is also reversed, and was corrected. However, the data from the CPL (A) and Bowman (B) data were used as observed (Figure 12).

The resulting fault plane solution (equal area, lower hemisphere projection) indicates normal faulting. For shallower events < 1.5 km we obtained strike slip solutions (7th Report). Thus normal faulting at greater depths indicates that the load is the largest principal stress.

III.6. *Intensity Survey*

An intensity survey was carried out personally in the epicentral area, and through newspapers in Anderson (S.C.), Brevard (N.C.) and Seneca (S.C.). These resulted in 85 responses. These data were supplemented with 32 responses from Postmasters in a larger region obtained by Carl Stover of USGS. An isoseismal map (Figure 13) indicates a felt area of over 15,000 sq. km, of which intensity V shaking occurred in 1220 sq. km. In Figure 13 the epicenter is indicated by an asterick. The epicentral area appears to be elongated in a NE-SW direction--corresponding to the geologic grain in the area. The locations reporting a MM intensity V or greater are summarized in Table 4.

FPS OF AUGUST 26, 1979
JOCASSEE EARTHQUAKE

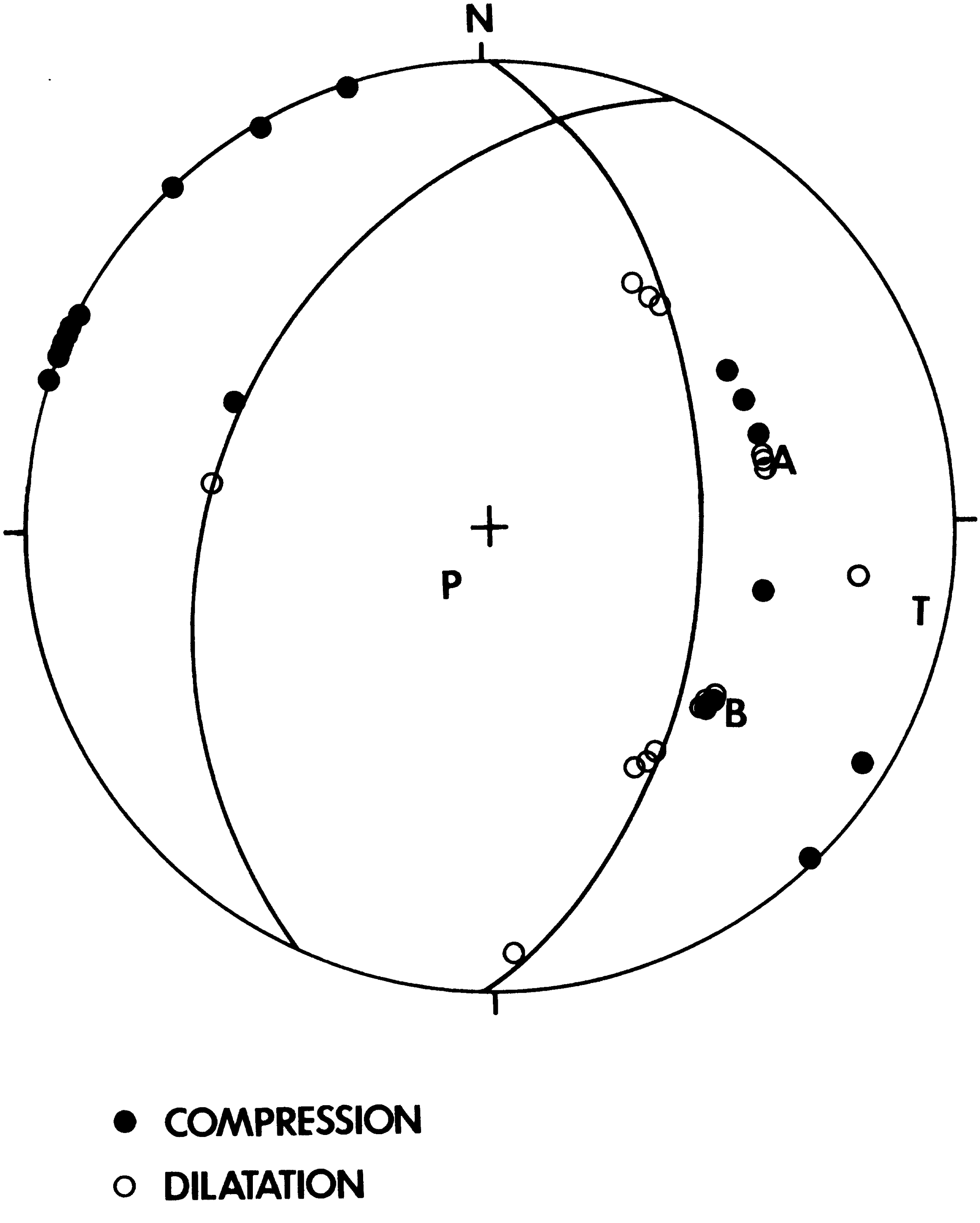


Figure 12

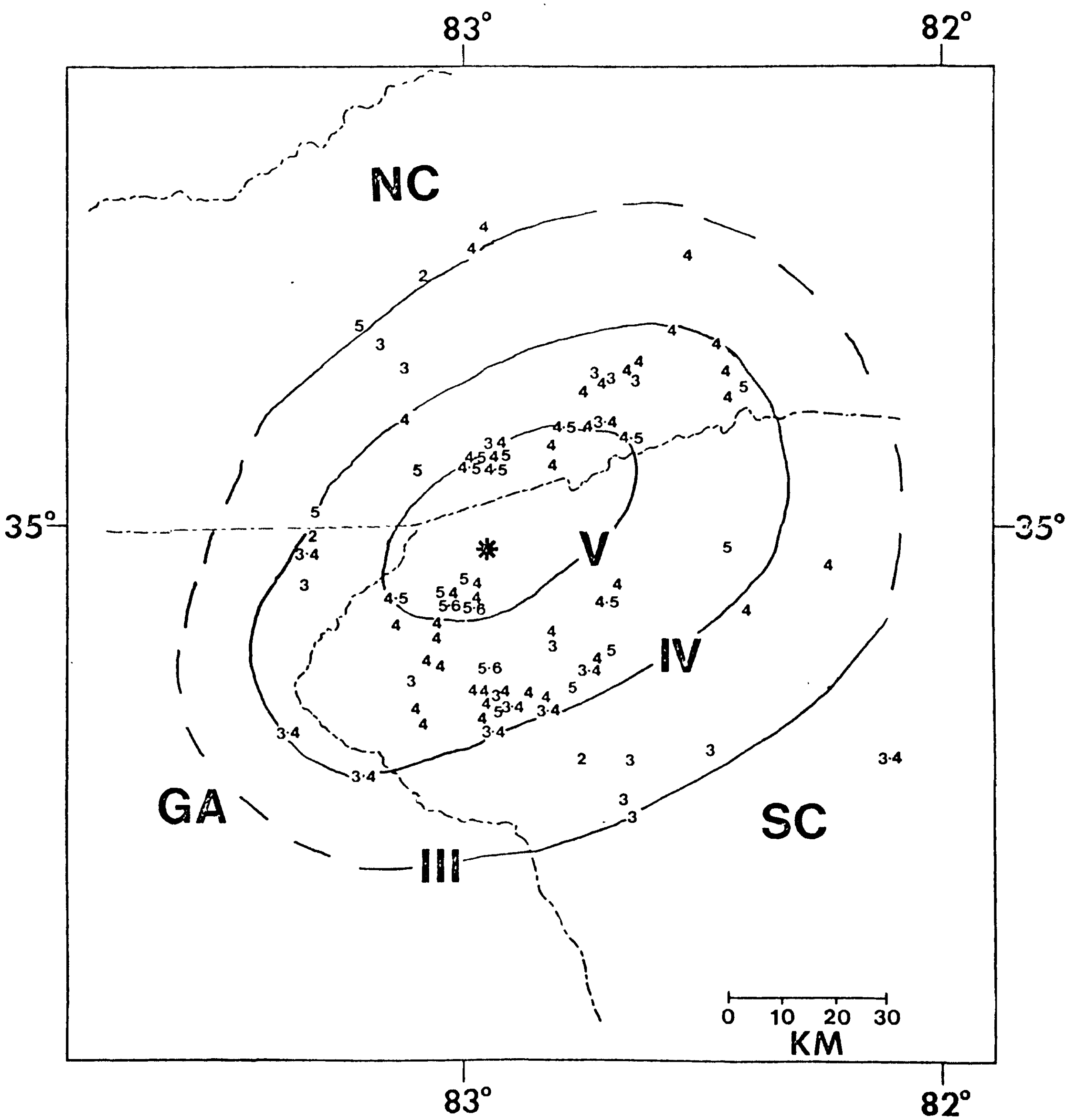


Figure 13

TABLE 4

		LOCATION
INTENSITY V - VI	S.C.	Salem, Tamassee, Seneca
INTENSITY V	S.C.	Travelers Rest, Liberty, Central Tamassee, Salem, Seneca
	N.C.	Lake Toxaway, Cashiers, Webster, Scaly Mt., Zirconia

III.7. *Discussion*

The occurrence of a M_{bLg} 3.7 event, almost four years after the start of reservoir induced seismicity at Lake Jocassee was surprising. The seismicity had decreased from an average of about 5 events/day (December 1975 - January 1976) to about 1 recorded event every 2 days (December 1978). The level of seismicity had decreased from M_L 3.2 (November 1975) to about 3 events/year ($2.5 > M_L > 2.0$). To seek possible association with the lake level the daily (8 AM reading) water level is plotted for the period June - September 1979 (Figure 9E, top row). The maximum and minimum lake levels are indicated by bars. The daily change in water level is shown in the next row. The daily seismic energy release and number of events are shown in the two bottom rows. The seismicity appears to be random. The only suggestions of association with the lake level are large fluctuations in the lake level, and that the average lake level has been high. This is perhaps more apparent in Figure 14 which shows data over a 4 3/4 year period (January 1975 - September 1979). Each data point represents a 10-day period. From top to bottom: First row shows the average water level in Lake Jocassee over a 10-day period, with the bars indicating the maximum and minimum water level in that 10-day period. The change in water level between the 10-day mean water levels is shown in the next row. In order to quantify this change, the area in each segment, below and above the zero (or no change) line was calculated in arbitrary units. This 'change time', representing the duration and amount of change, is plotted in the next row. This was compared with the total number of events (in 10-day period) and the times of events with magnitude greater than 2 were noted.

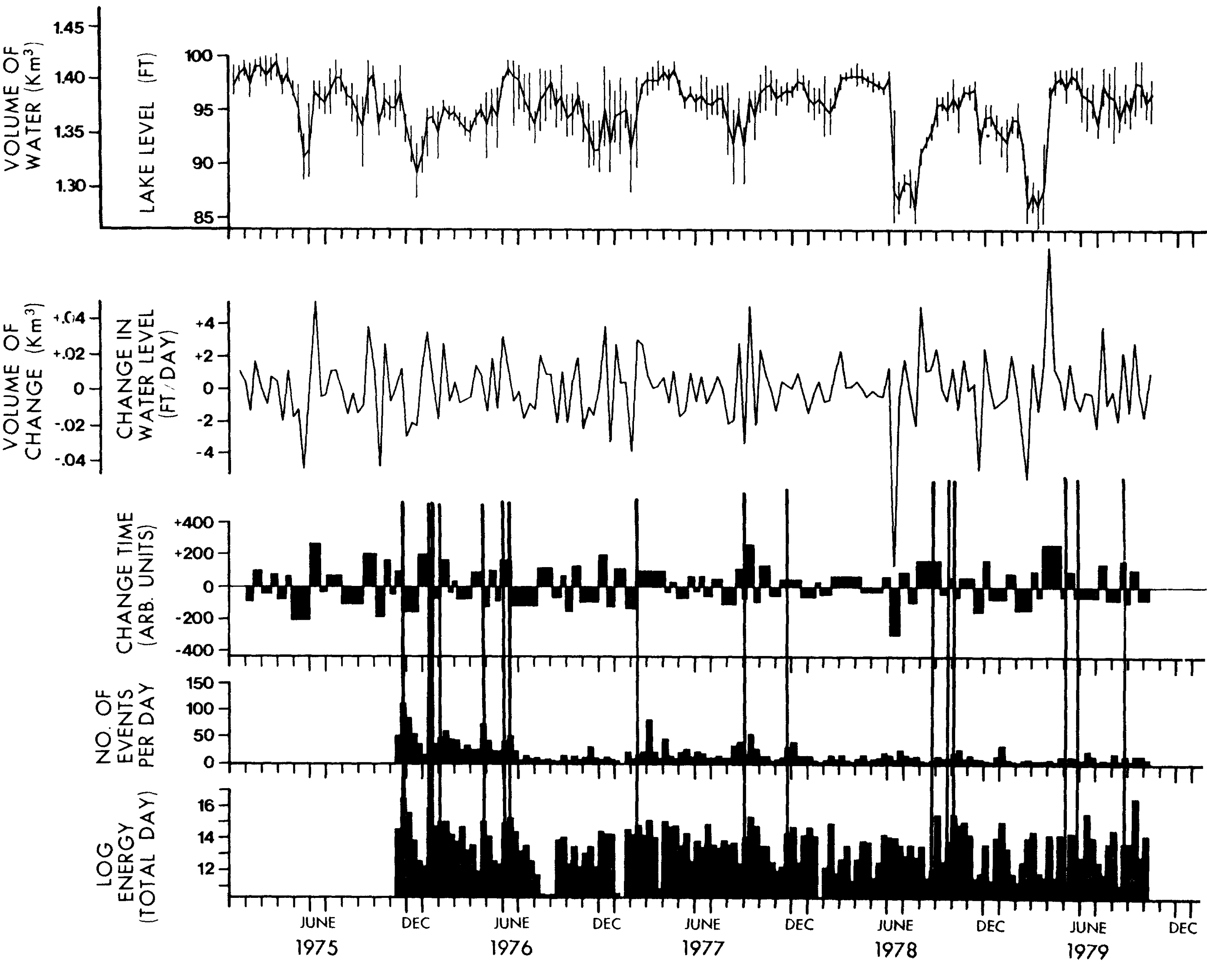

VOLUME OF WATER (Km³)
1.45
1.40
1.35
1.30
LAKE LEVEL (FT)
100
95
90
85
VOLUME OF CHANGE (Km³)
+.04
+.02
0
-.02
-.04
CHANGE IN WATER LEVEL (FT/DAY)
+4
+2
0
-2
-4
CHANGE TIME (ARB. UNITS)
+400
+200
0
-200
-400
NO. OF EVENTS PER DAY
150
100
50
0
LOG ENERGY (TOTAL DAY)
16
14
12
JUNE
DEC
JUNE
DEC
JUNE
DEC
JUNE
DEC
JUNE
DEC
1975
1976
1977
1978
1979

Figure 14

The most dramatic decrease in the lake level occurred in early summer 1978. After July 1978, the lake level was raised for the next few months and correspondingly there was a large 'change time'. Few weeks following the raising of the lake there occurred three $M_L > 2.0$ events (8/21/78, 9/21/78 and 10/05/78). We suggest that the general increase in the level of activity was caused by the rapid rise of water level in the lake.

In February and March 1979 the lake level had been lowered to 85' (100' corresponds to 1,110' ASL) and was rapidly raised to 97' in March - April 1979. We suggest that this rapid increase in water level, with a corresponding large 'change time' triggered a series of events that culminated in the M_{bLg} 3.7 event on August 25, 1979.

The earthquake (#13) occurred in a "seismic gap" between the aftershock zones of previous large earthquakes and its aftershocks were deeper than those of events #3 and #7 (Figure 15).

III.7.1. Implications on the Ambient Stress Field

We have limited in situ stress measurements at Bad Creek, about 9 km NW of Jocassee dam. These consist of hydrofracture measurements in a borehole by Haimson (1975) and overcoring in a pilot tunnel by Schaeffer *et al.*, (1979). The well head was located at an elevation of about 400 m on a hillside whereas the pilot tunnel was drilled about 180 m below the surface. The results of these measurements are shown in Table 5 and Haimson's data are shown in Figure 16 also. These data indicate very large stresses in the top 300 km. However the existence of strike slip faulting (7th Technical Report) at depths of 0.5 - 1.5 km indicates that at those depths the vertical stress is the intermediate prinicpal stress. At greater depths

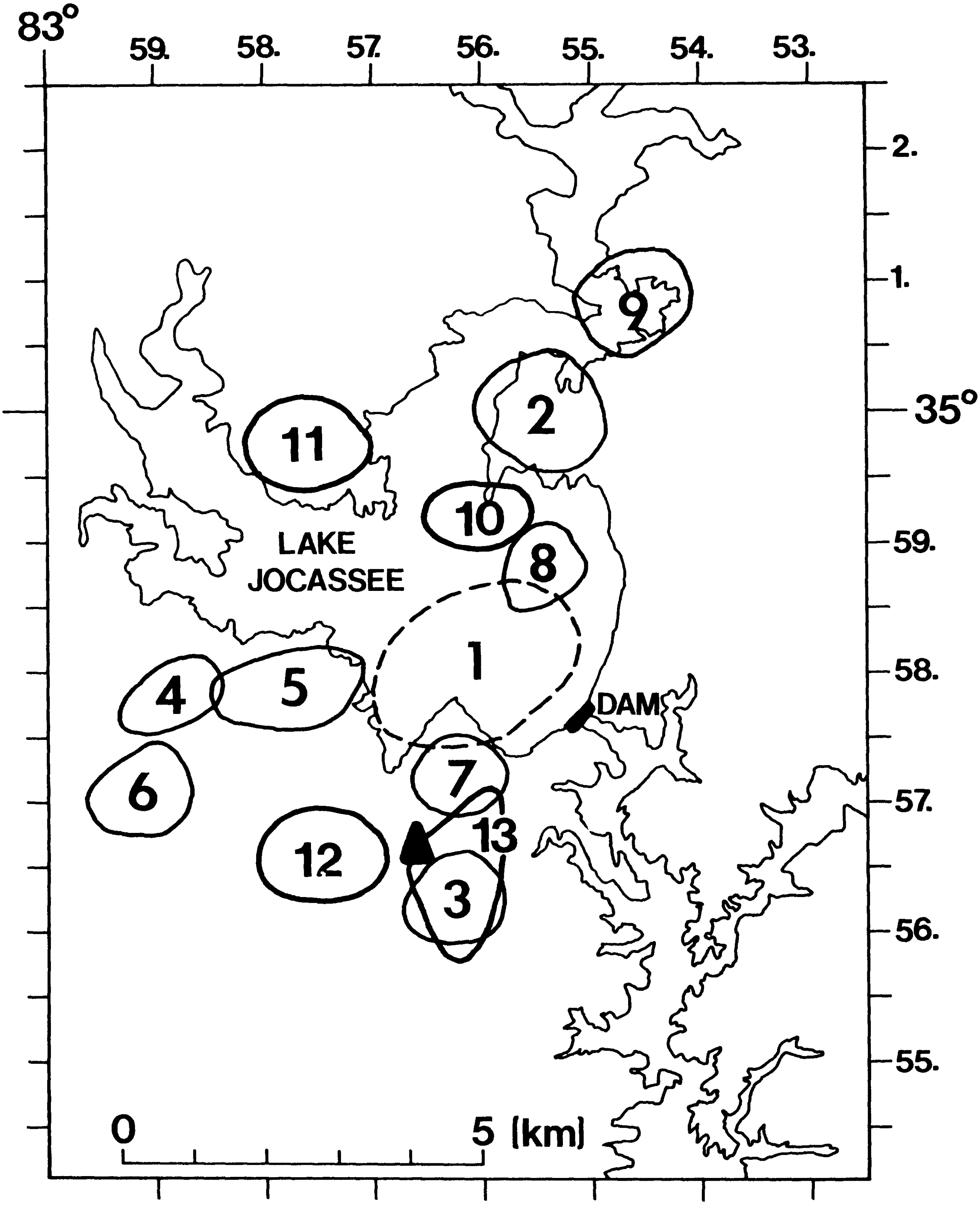

83°
59.
58.
57.
56.
55.
54.
53.
2.
1.
35°
59.
58.
57.
56.
55.
LAKE
JOCASSEE
DAM
1
2
3
4
5
6
7
8
9
10
11
12
13
0
5 (km)

Figure 15

TABLE 5

AVERAGE PRINCIPAL STRESS VALUES

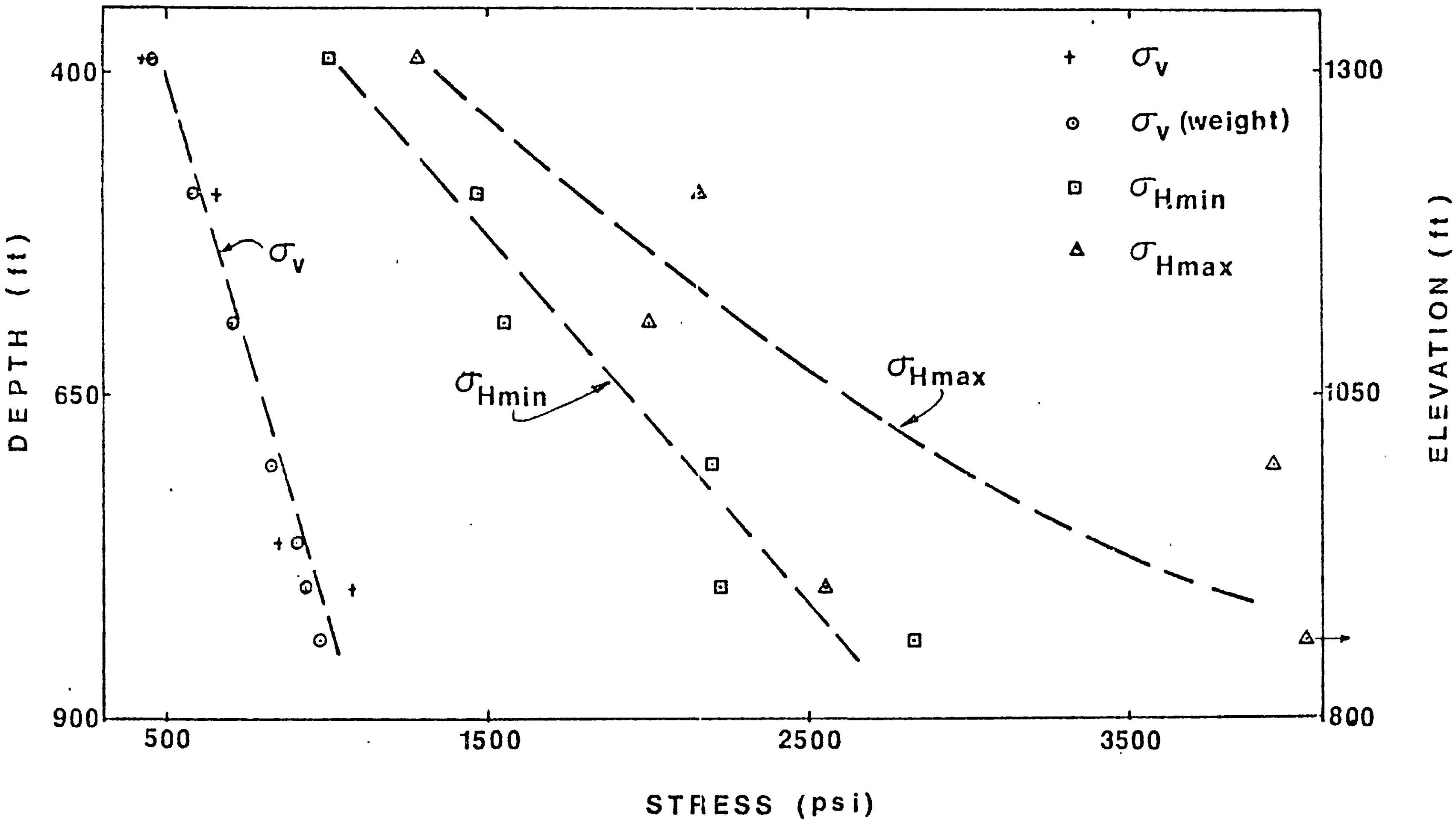
HYDROFRACTURE DATA (HAIMSON, 1975)

ELEVATION a.s.l.(m)	DEPTH BELOW SURFACE(m)	σ_H MIN bars	DIRECTION	σ_H MAX bars	DIRECTION
398	119	69	N66°W	88	N24°E
367	151	102	N84°W	148	N06°E
338	181	106	N12°W	138	N78°E
308	215	152	N22°W	272	N68°E
283	243	$\geq$155	N48°W	$\geq$176	N42°E
272	255	195	N34°W	340	N56°E
Av. at 290 (Site of planned powerhouse)	236	159±25	N30°W	228±55	N60°E

OVERCORING DATA (SCHAEFFER, *ET AL.*, 1979)

338	181	184	N32°W	293	N57°E

σ_V = 102 bars



From Haimson (1975)

Figure 16 - Variation of Calculated Stresses with Depth

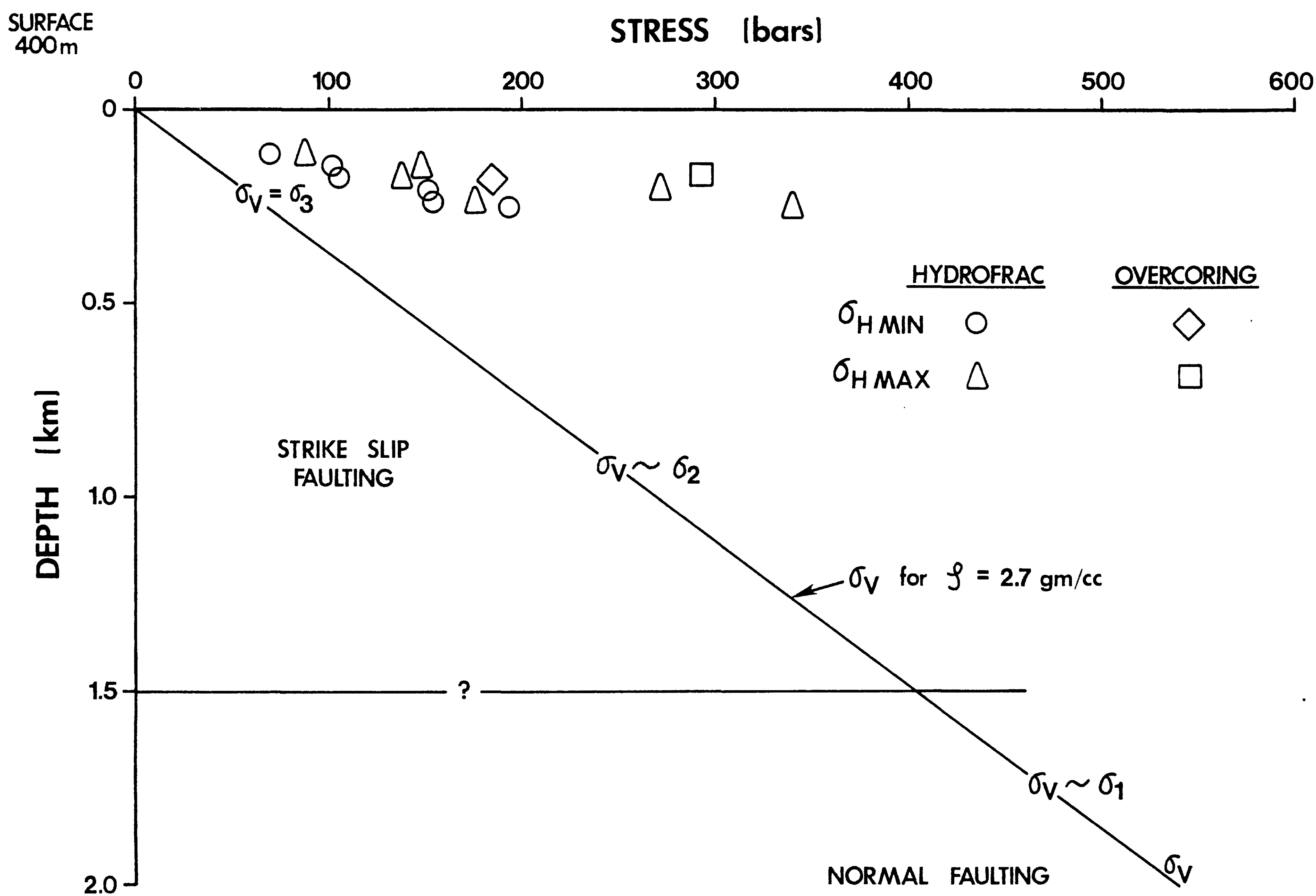
$\sim$ 2 km, we have normal faulting indicating that the vertical stress is the greatest principal stress (Figure 17). In Haimson's analyses the vertical stress was computed assuming it to be due to the load with a density of 2.7 g/cm^3. However in the overcoring results of Schaeffer *et al.* (1979) the vertical stress was *measured* to be about 102 bars at a depth of $\sim$ 180 m. This is almost twice what one would expect due to the load. ($\sigma_V = \rho gh = 2.7 \times 10^3 \times 180 \times 10^2 \times 10^{-6}$ bars $=$ 49 bars).

Such observations are rare but not unheard of. For example, Fyfe *et al.*, (1978, p. 226) note that "in the Snowy Mountain region of Australia the vertical pressure at a depth of 300 m was found to be over 120 bars, rather than 80 - 90 bars one would forecast using $\sigma_V = \rho gh$."

Thus in addition to the very high horizontal stress gradients encountered at shallow depths, there are large vertical stresses too. This suggests a highly stressed rock at shallow ($<$ 500 m?) depths--and perhaps accounting for the observed induced seismicity.

III.8. *Conclusion*

In our previous report (through 1978) (8th Technical Report) we had concluded that, "Now a large number of the 'locked' portions have been unlocked--and the rocks have adjusted to the new stress condition caused by impoundment. The level of seismicity has dropped considerably. The lack of earthquakes with $M_L \geq 3.0$ after the initial shock suggests that the surface areas of the locked portions (to which the magnitude is related) are too small to cause any major shock ($M_L > 3.0$). Consequently we would conclude that the activity will continue to decline unless there is a period of prolonged lowering of lake level followed by a period of sustained, rapid refilling." Our previous observation thus appears to have been



SURFACE 400m
STRESS (bars)
0
100
200
300
400
500
600
DEPTH (km)
0
0.5
1.0
1.5
2.0
$\sigma_V = \sigma_3$
HYDROFRAC
OVERCORING
$\sigma_{H\ MIN}$
$\sigma_{H\ MAX}$
STRIKE SLIP FAULTING
$\sigma_V \sim \sigma_2$
σ_V for ρ = 2.7 gm/cc
?
$\sigma_V \sim \sigma_1$
NORMAL FAULTING
σ_V

Figure 17

borne out by the occurrence of the August 25, 1979 event. Thus it appears the conclusion quoted above is still valid.

IV. SEISMIC ACTIVITY AT MONTICELLO RESERVOIR

IV.1. *Background*

This report covers the seismic activity at Monticello from June 1978 to September 1979. The earlier seismic activity, filling history of the reservoir and geology of the area have been given in the 7th and 8th reports. The station deployment is given in Secion IV.2 and the routine earthquake locations determined with JSC and SCE&G network stations for the period June 1978 to September 1979 are given in Section IV.3. The possible relationship between the water level fluctuations and seismicity is given in Section IV.4. The locations obtained with the magnetic tape data for the period from July to December 1978 are given in Section V.

Monticello reservoir was impounded between December 1977 and February 1978. The number of events recorded in the months of January, February and March 1978 were 530, 1585 and 462, respectively. From April 1978, the number of recorded earthquakes started to decrease considerably. In that month, the number of recorded earthquakes was 213. In May 1978 the number of recorded earthquakes was 145. In June, 109 earthquakes were recorded. A spurt of increased activity occurred again from September - December 1978, when 150 - 250 earthquakes were recorded every month and also several $M_L > 2$ earthquakes. The activity again decreased until September 1979 with occasional M_L 2 earthquakes and associated seismicity. The monthly number of recorded earthquakes being less than 50 (Table 6).

IV.2. *Station Deployment*

The seismograph stations deployed in the Monticello area are shown in Figures 18 and 19 and listed in Appendix V. JSC a permanent station

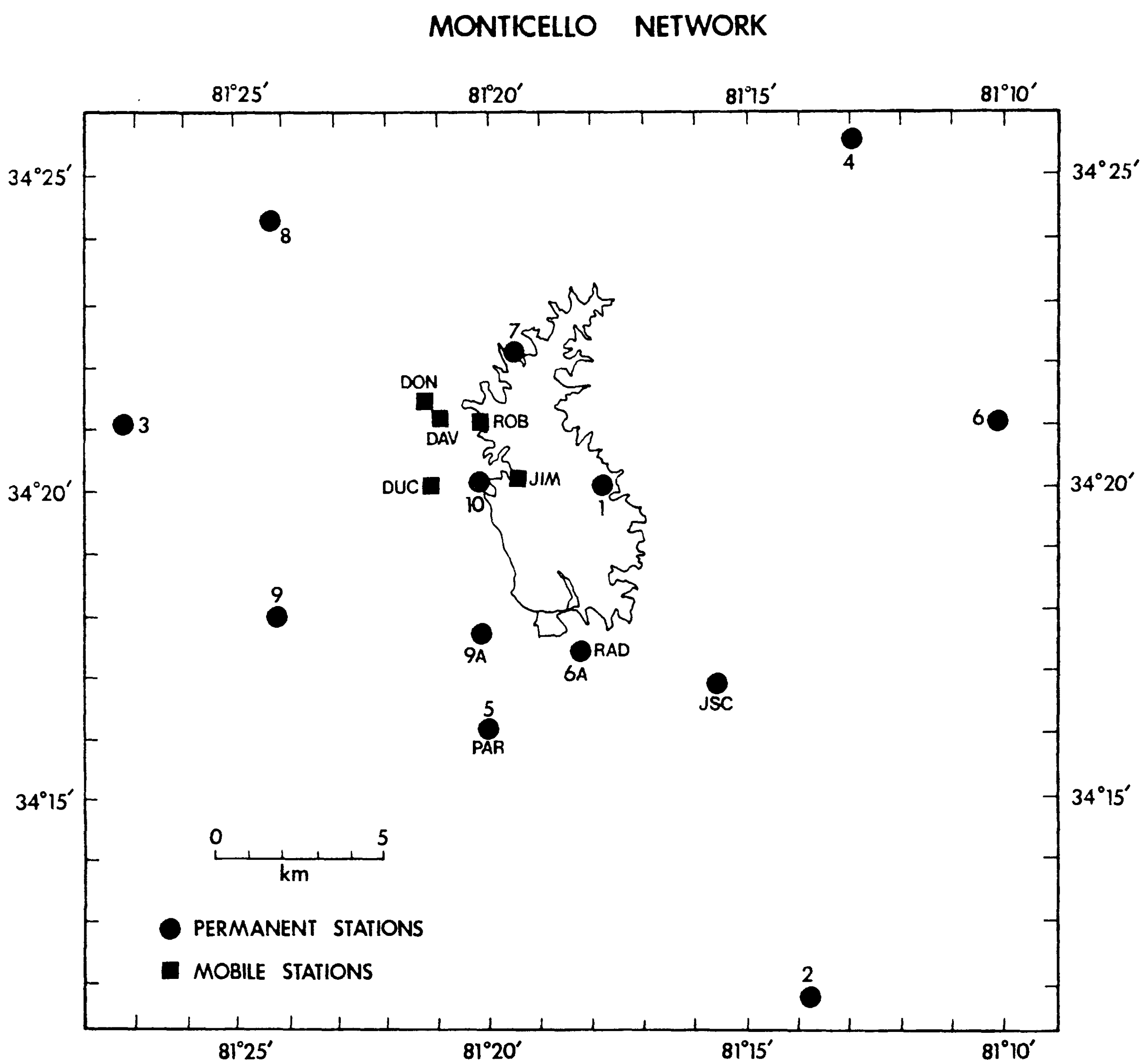

MONTICELLO NETWORK
81°25'
81°20'
81°15'
81°10'
34°25'
34°20'
34°15'
4
8
7
DON
DAV
ROB
3
6
DUC
10
JIM
1
9
9A
RAD
6A
JSC
5
PAR
0
5
km
PERMANENT STATIONS
MOBILE STATIONS
2

Figure 18

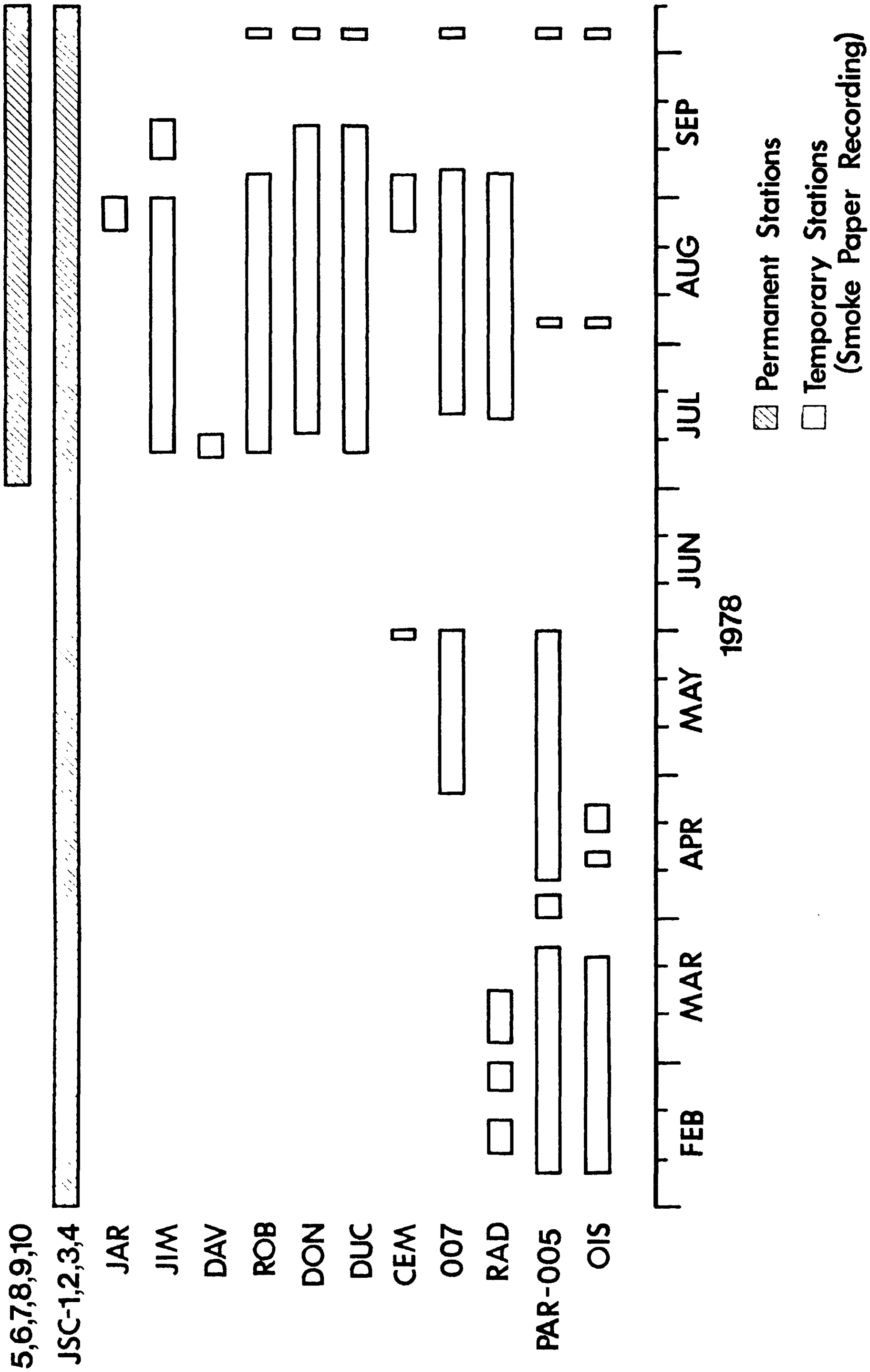

5,6,7,8,9,10
JSC-1,2,3,4
JAR
JIM
DAV
ROB
DON
DUC
CEM
007
RAD
PAR-005
OIS
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
1978
Permanent Stations
Temporary Stations
(Smoke Paper Recording)

Figure 19

of the S. C. seismographic network has been in operation since October 1973. About 3 months before impoundment of the Monticello reservoir, South Carolina Electric and Gas Company (SCE&G) installed a 4 station network. The stations 1, 2, 3 and 4 are located in a triangular array, with station 1 in the center serving as a recording site (Figure 18). Meaningful data was obtained from the four station network from November 30, 1977.

Following increased seismicity we deployed 2 - 3 portable seismographs in the area from February 7, 1978. The number of portable seismographs was increased to 3 - 8 from July to September 1978 (Figure 18). During this time USGS deep well #1 was being drilled, and the object was to detect any increase in seismicity that might have been associated with the drilling and subsequent hydrofracturing.

In order to get better hypocentral data, USGS installed 6 additional stations (#5 - 10) in May 1978. However due to initial timing problems, useful data were obtained from July 1978. The locations of all stations are given in Figure 18 and are listed in Appendix V. Since October 1978 we have continuous data (on magnetic tape) for stations 1 - 10 and visual (on helicorder) for stations 1 - 4 and JSC. The visual data are interpreted routinely (Section IV.3); however there is a large delay in getting tape playbacks from USGS in Golden (Section V).

IV.3. *Results of the Location of Earthquakes with SCE&G Stations and Portable Stations*

Earthquakes at Monticello were located on a routine basis from the data of station JSC, SCE&G stations and portable seismographs, using computer program HYPO71 (Lee and Lahr, 1972) and a velocity model developed for the Monticello reservoir area (Appendix VI). Magnitudes were calculated from the signal durations at station JSC, where the duration (D) and magnitude (M_L) relation is

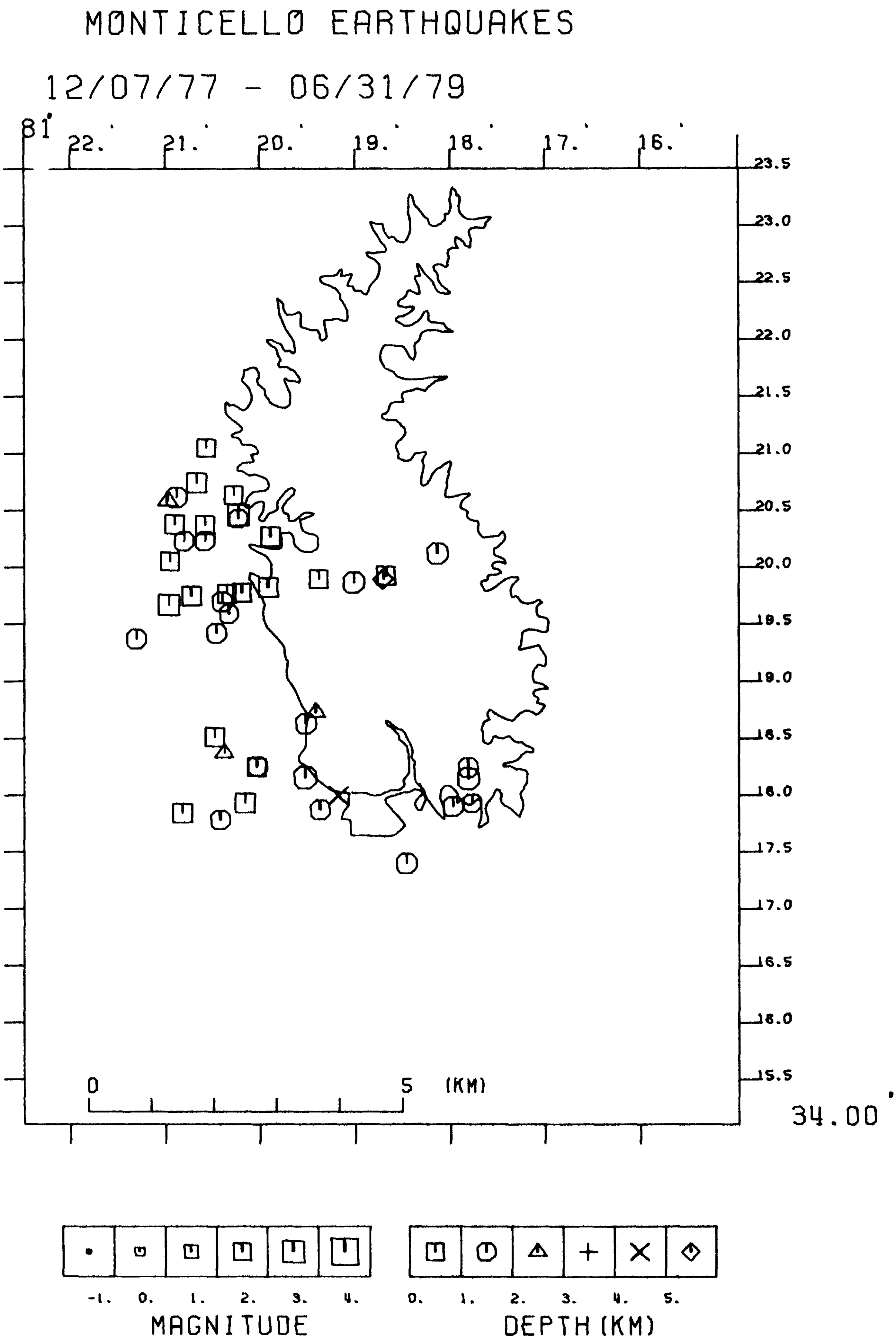
$$M_L = -1.83 + 2.04 \log D.$$

The daily energy release was calculated using a simplified magnitude (M_L) energy (E) relation (Gutenberg and Richter, 1956)

$$\log_{10}E = 11.8 + 1.5 M_L.$$

The monthly number of recorded and located earthquakes from June 1978 to September 1979 is given in Table 6. A list of $M_L \geq 2.0$ earthquakes during this period is also given in Table 7. Most of M_L 2 earthquakes occurred outside the western margin of the reservoir during this period (Figures 20A and 20B). All the located earthquakes from December 1977 to September 1979 are shown in Figure 21. The majority of epicenters are included in two E - W bands in the central and southern parts of the reservoir. For a detailed study the Monticello reservoir area was divided into 7 subareas, viz., NW, N, W, C, E, SW and S as shown in this Figure 21.

Earthquake locations obtained in the reporting period in the Monticello reservoir area are given in Appendix VII. The seismic activity has been plotted on a monthly basis, showing spatial distribution in Figures 22A - P. In these figures the symbols indicate depth and the size is proportional to the magnitude of the events. Only the well-located events have been plotted (RMS <0.1 sec, ERH < 1.5 km). Location of some of the stations and reservoir boundary is also given. These epicentral locations were obtained using stations JSC, 1, 2, 3 and 4 and portable seismographs (until September 1978).



MONTICELLO EARTHQUAKES
12/07/77 - 06/31/79
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 20A

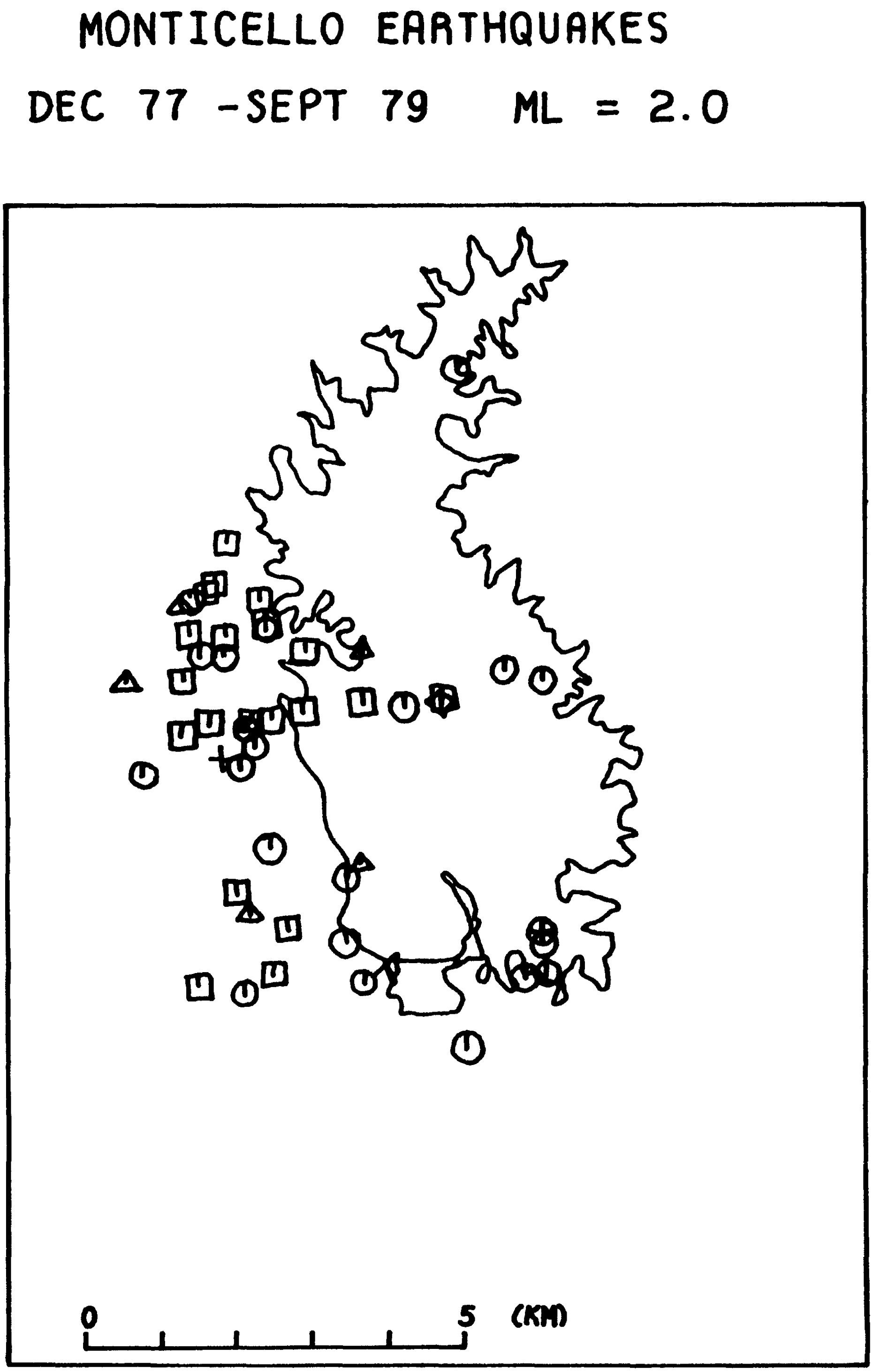
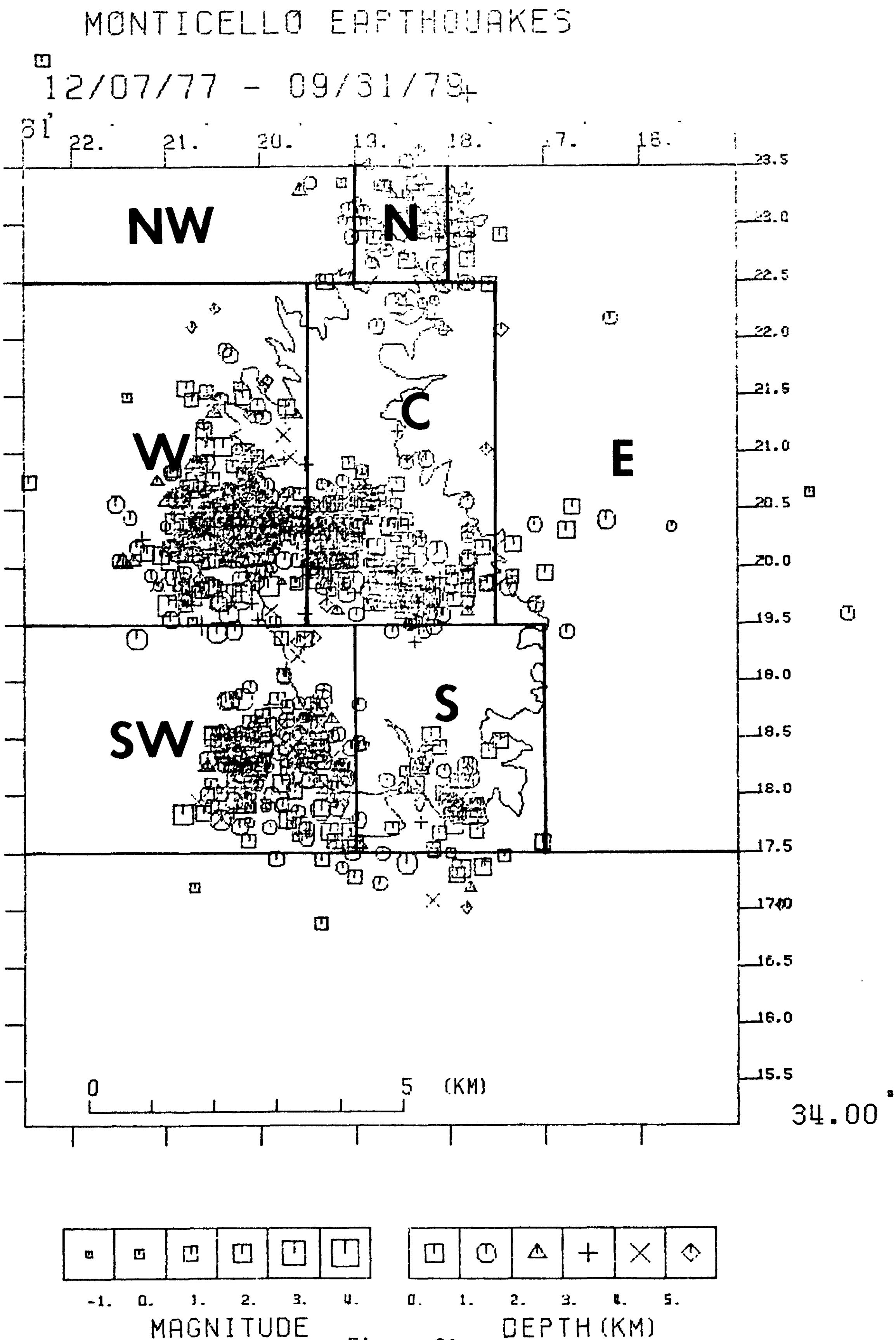


Figure 20B



MONTICELLO EARTHQUAKES
12/07/77 - 09/31/79
81'
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
34.00
NW
N
W
C
E
SW
S
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 21

Seismicity until May 1978 was described in the Seventh Technical Report (Talwani *et al.*, 1978). Monthly seismic activity from June 1978 to September 1979 is described as follows. In June 1978 the number of events recorded was 109, with most of the activity occurring in the middle of the reservoir and some of the events along the southern margin of the reservoir (Figure 22A). A magnitude 2 earthquake occurred in subarea C near the reservoir boundary.

In July 1978, activity was spread over the whole area (Figure 22B). Although this month was relatively less active with no M_L 2 earthquake, the number of located earthquakes was large as very small earthquakes could be located using data of increased number of smokers. These smaller earthquakes were located to study ts/tp value in detail.

Two earthquakes of M_L 2.7 and 2.5 occurred on August 27, 1978. These were located near the SW boundary of the reservoir. The M_L 2.7 earthquake registered an acceleration of 0.25g on a strong motion accelerograph located about 1 km away from the epicenter. Epicentral locations in August were also dispersed (Figure 22C) as in July.

In September 1978 one earthquake of M_L 2 occurred, in the SW subarea. These earthquakes and the associated seismicity was confined to the western margin of the reservoir (Figure 22D). The number of earthquakes recorded was 221.

October 1978 was seismically active with six M_L 2 earthquakes. The M 2.9 earthquake on October 27, 1978 was the largest recorded earthquake from the Monticello reservoir area and registered almost the same acceleration

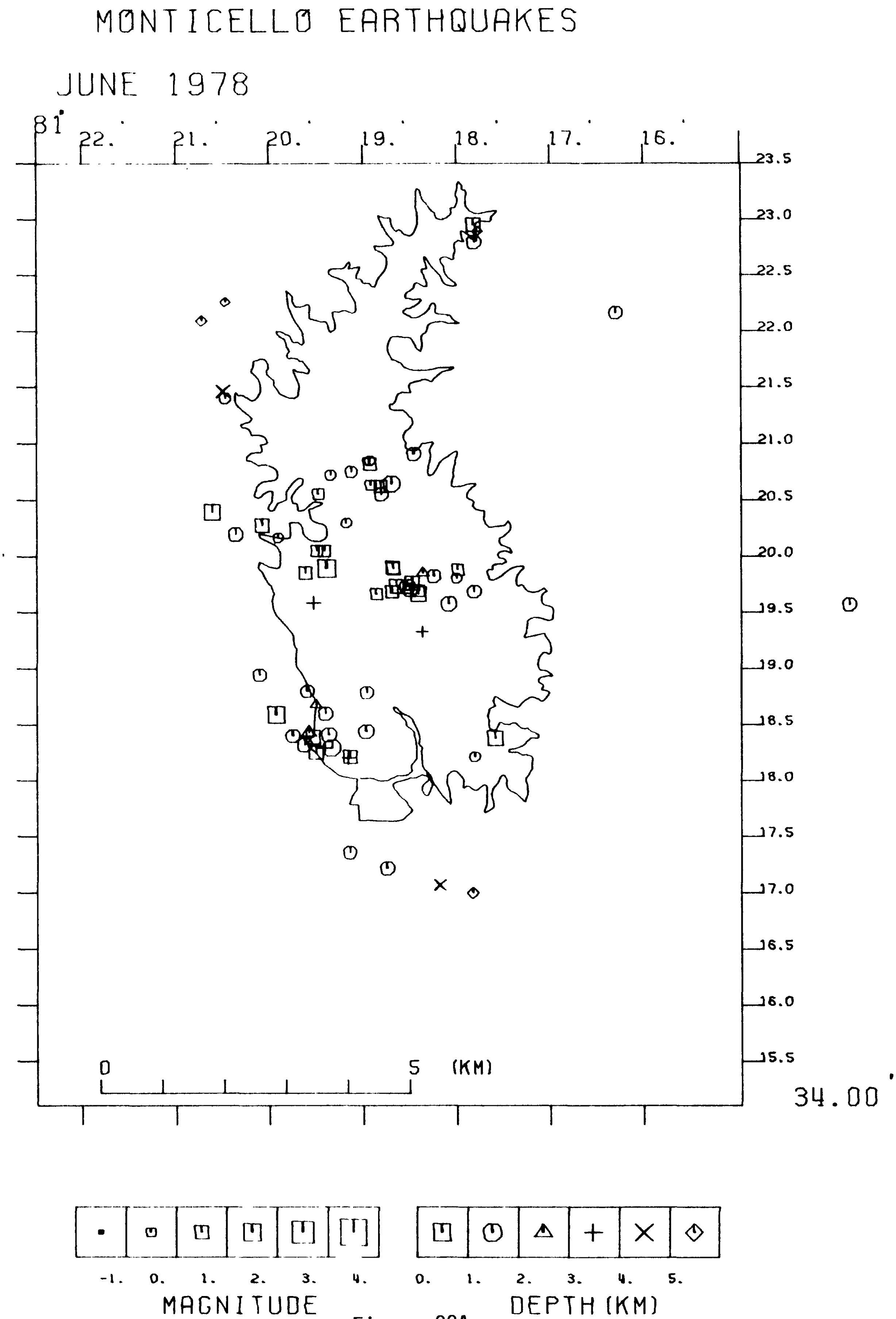

MONTICELLO EARTHQUAKES
JUNE 1978
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
34.00'
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22A

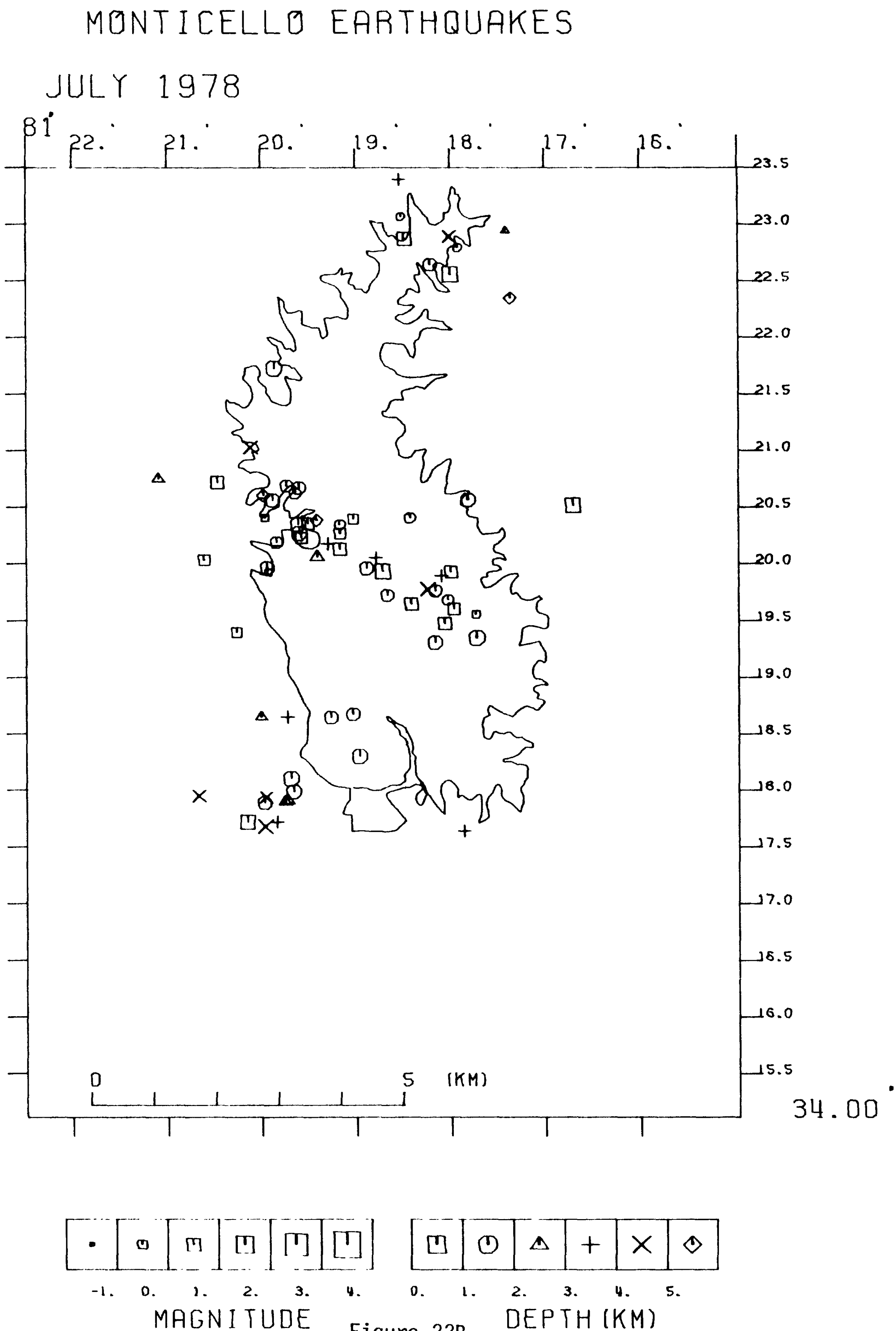
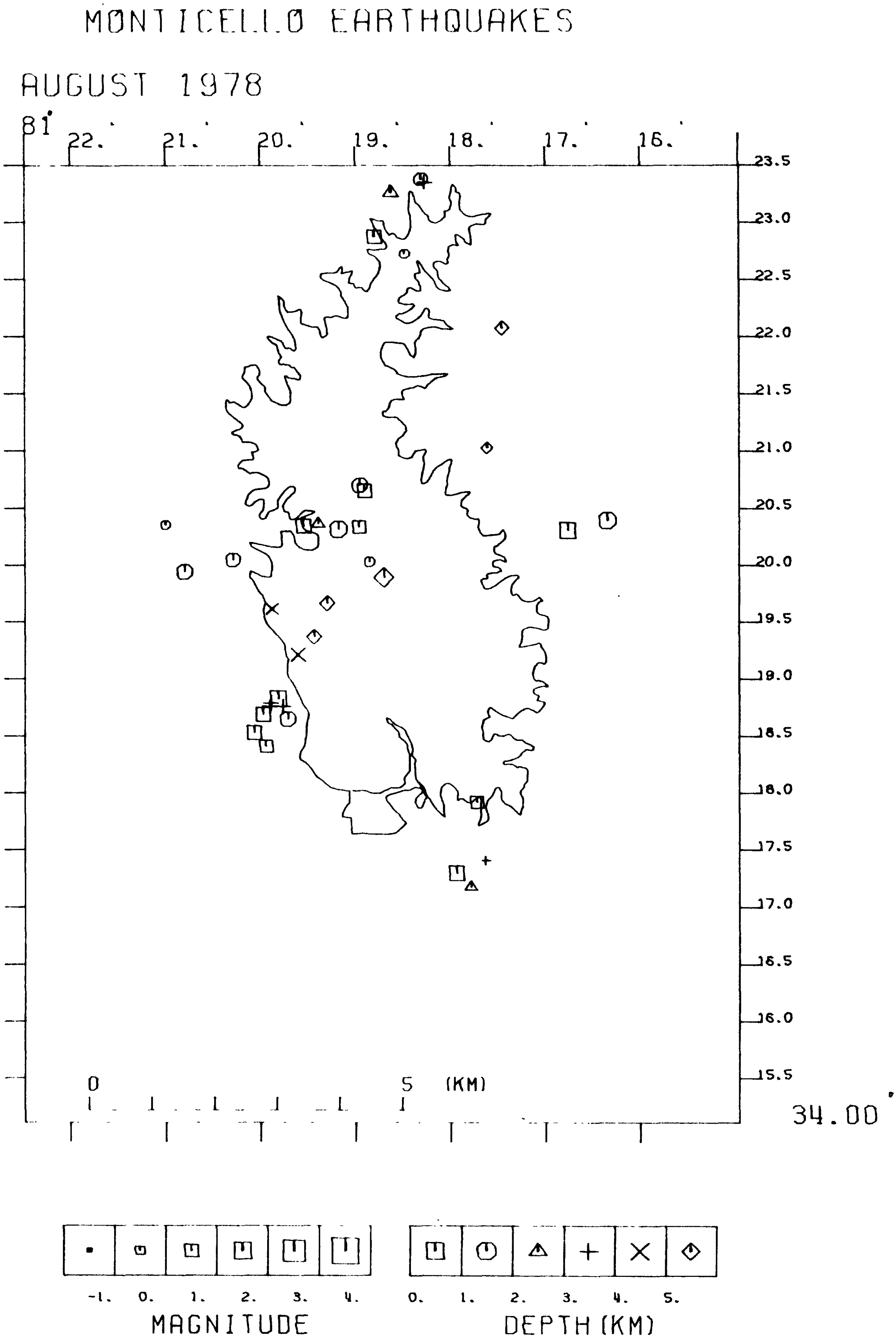

MONTICELLO EARTHQUAKES
JULY 1978
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22B



MONTICELLO EARTHQUAKES
AUGUST 1978
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22C

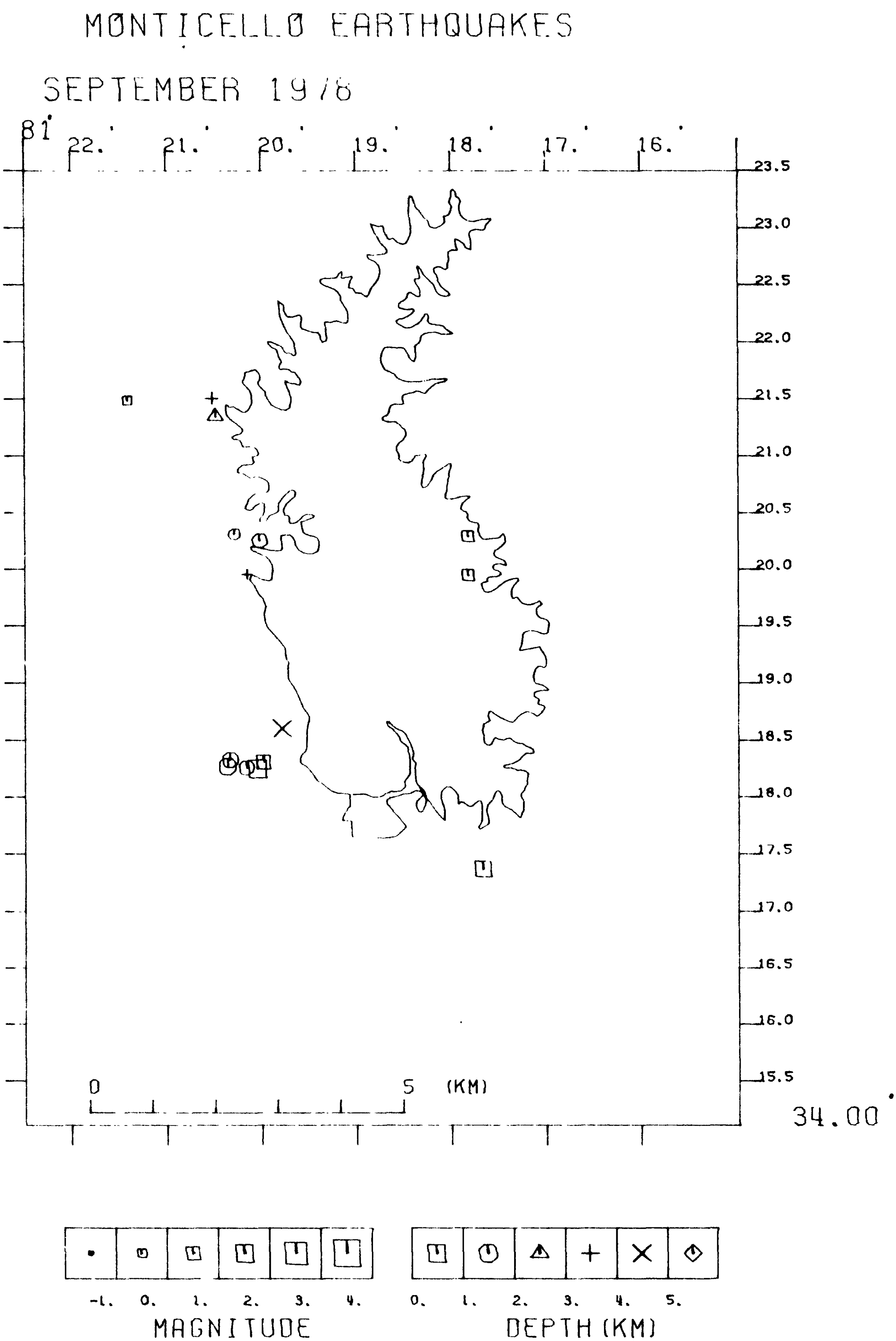

MØNTICELLØ EARTHQUAKES
SEPTEMBER 1978
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22D

as that of the August event. This earthquake and three others of $M_L \geq 2.0$ in October occurred in subarea SW outside the reservoir boundary. The other two $M_L \geq 2$ earthquakes in this month were located to be in subarea W, outside the reservoir boundary. Activity was mainly confined to two E - W bands, one in the middle of the reservoir and the other near the southern margin of the reservoir. A few events were located in subarea N (Figure 22E).

In the last week of November, three earthquakes of $M_L \geq 2.0$ occurred , one in subarea W and two in SW. Epicentral locations covered more or less the same area as in the previous month, except that they extended more in the SW direction (Figure 22F). 227 earthquakes were recorded during this month.

In December 1978, one earthquake of magnitude 2 occurred in area C in the middle of the reservoir. 127 earthquakes were recorded in this month. The epicentral locations covered more or less the same area as in the previous two months (Figure 22G).

Seismic activity decreased considerably from January 1979, dropping to an average of about 40 recorded earthquakes per month until September 1979. In January 1979 most of the earthquakes were confined to the western margin of the reservoir (Figure 22H). In February, the earthquakes were located in the middle part of the reservoir as an E - W band (Figure 22I). Three larger earthquakes were of M_L 2.6, 2.7 and 2.3. March, April and May 1979 were relatively quiet months with 20 - 30 recorded earthquakes and no earthquake of M_L 2 (Figures 22J - L).

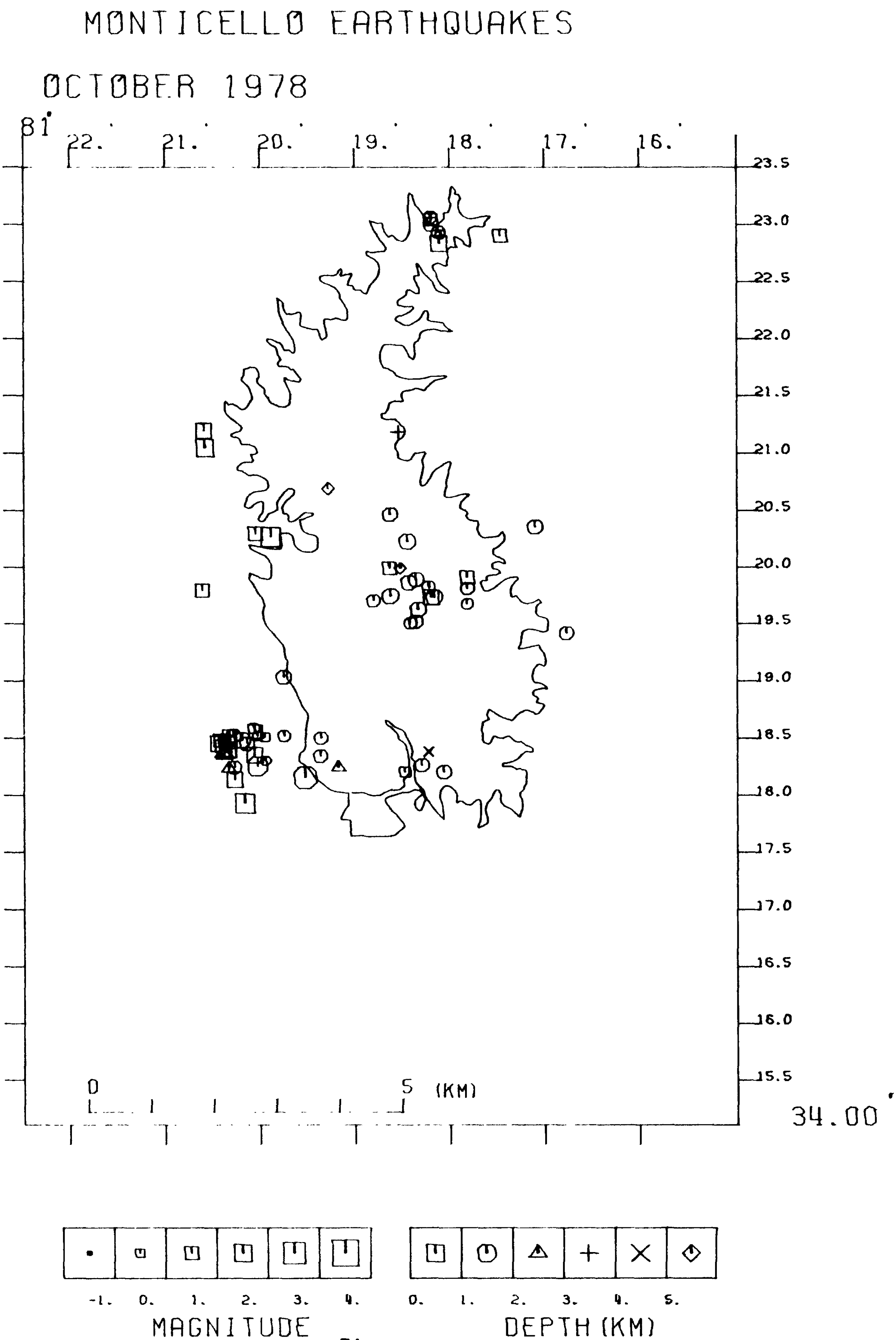

MONTICELLO EARTHQUAKES
OCTOBER 1978
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22E

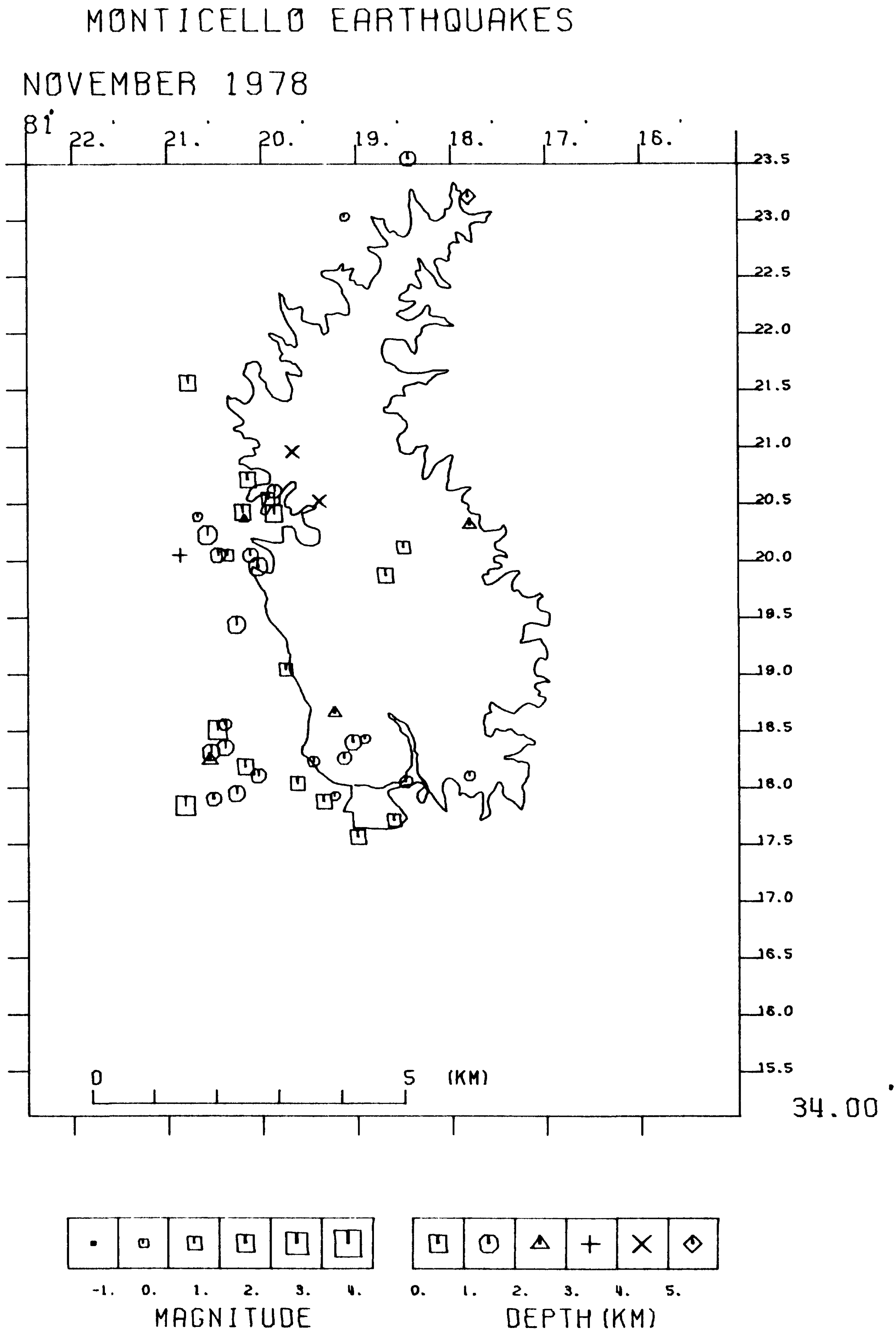
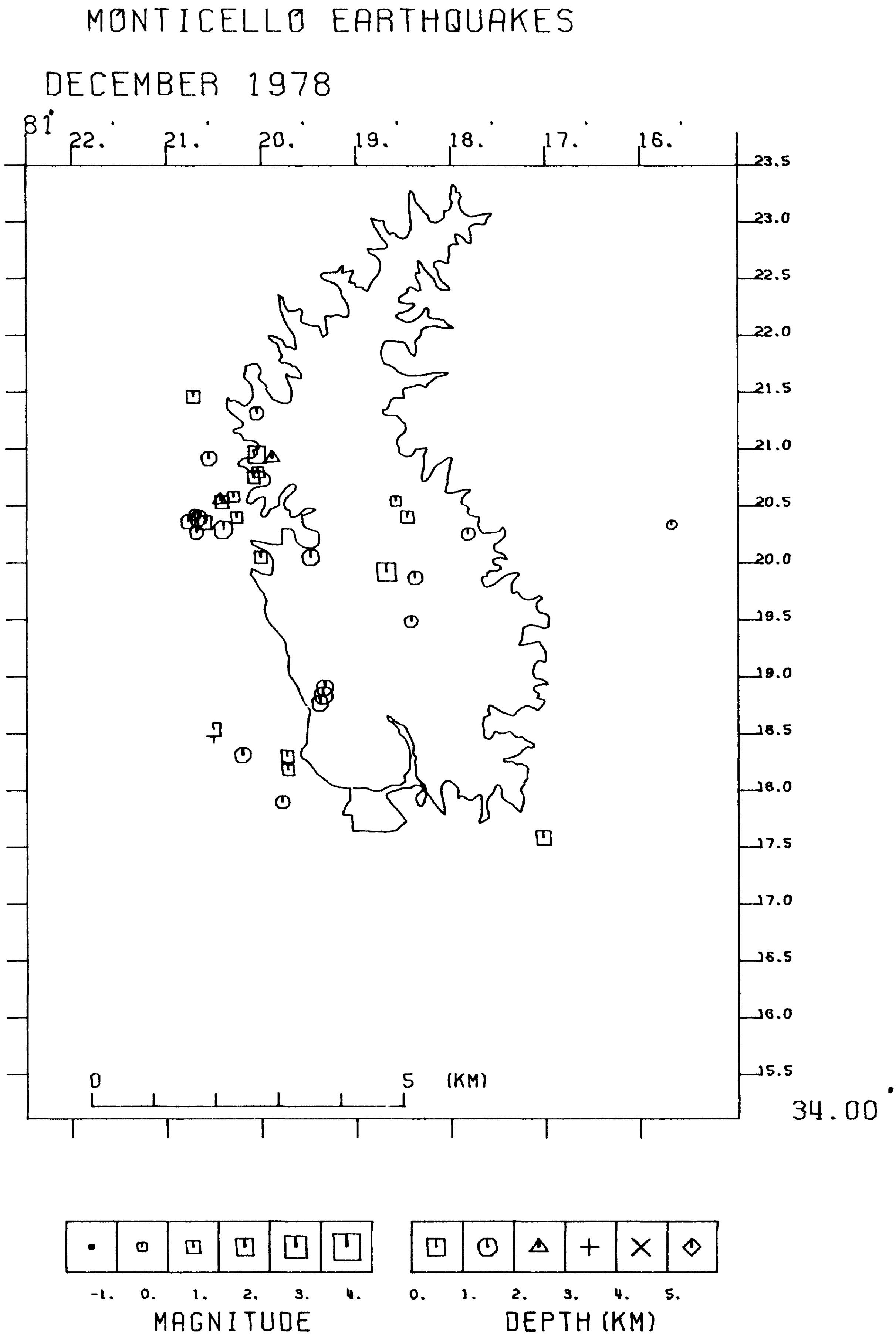

MONTICELLO EARTHQUAKES
NOVEMBER 1978
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22F



MONTICELLO EARTHQUAKES
DECEMBER 1978
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22G

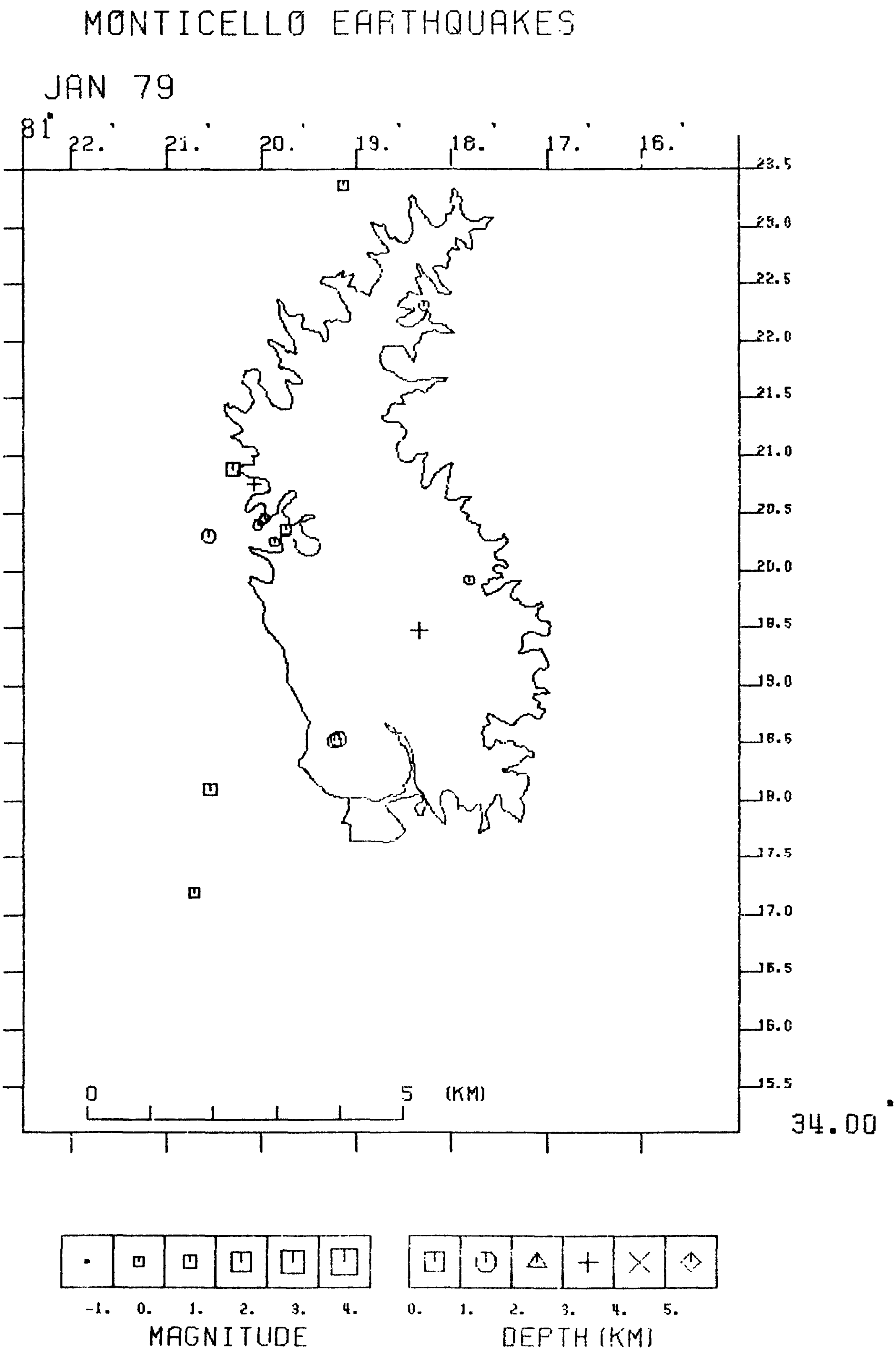

MONTICELLO EARTHQUAKES
JAN 79
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22H

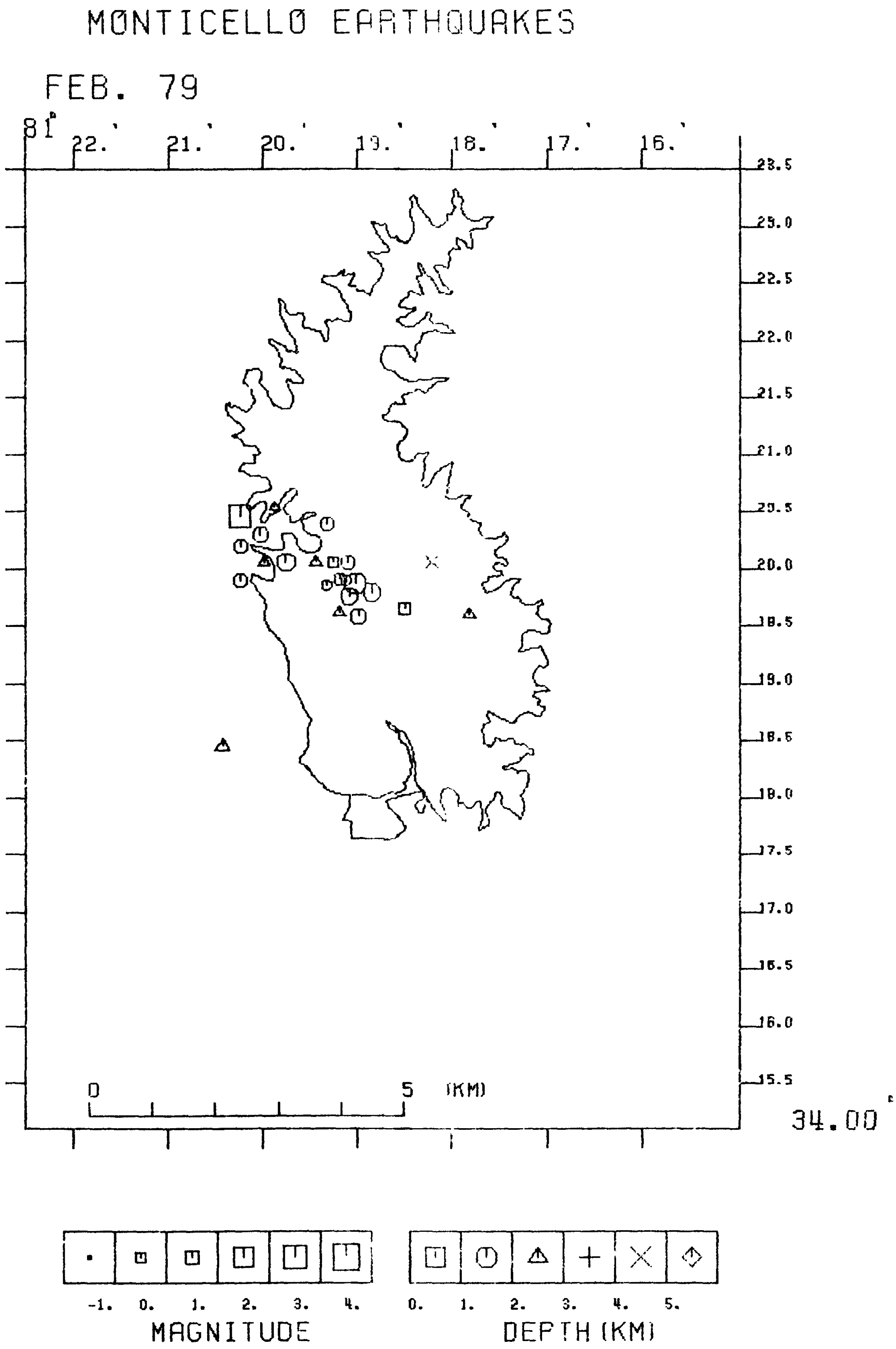

MONTICELLO EARTHQUAKES
FEB. 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22I

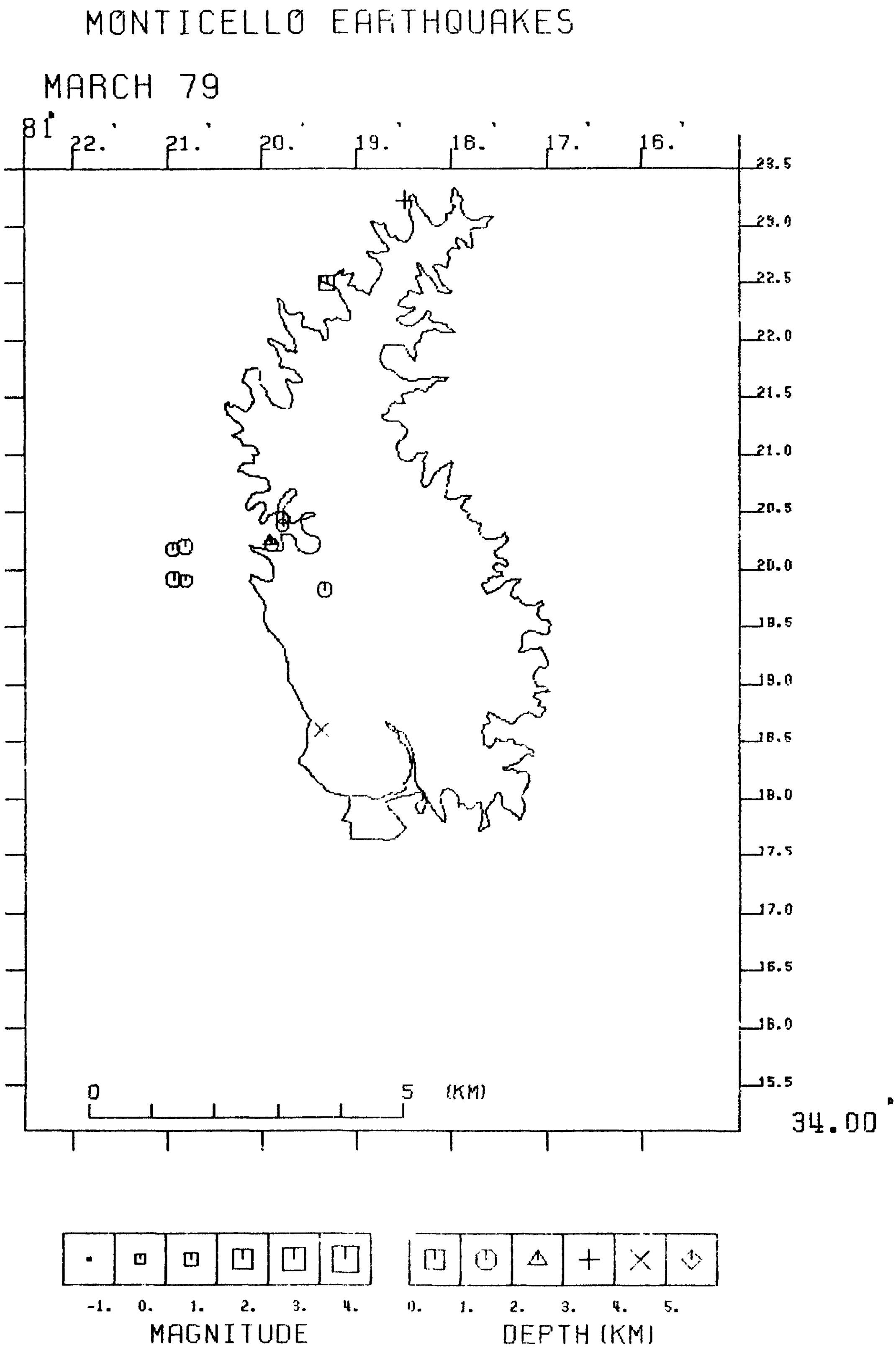

MONTICELLO EARTHQUAKES
MARCH 79
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
0
5
(KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22J

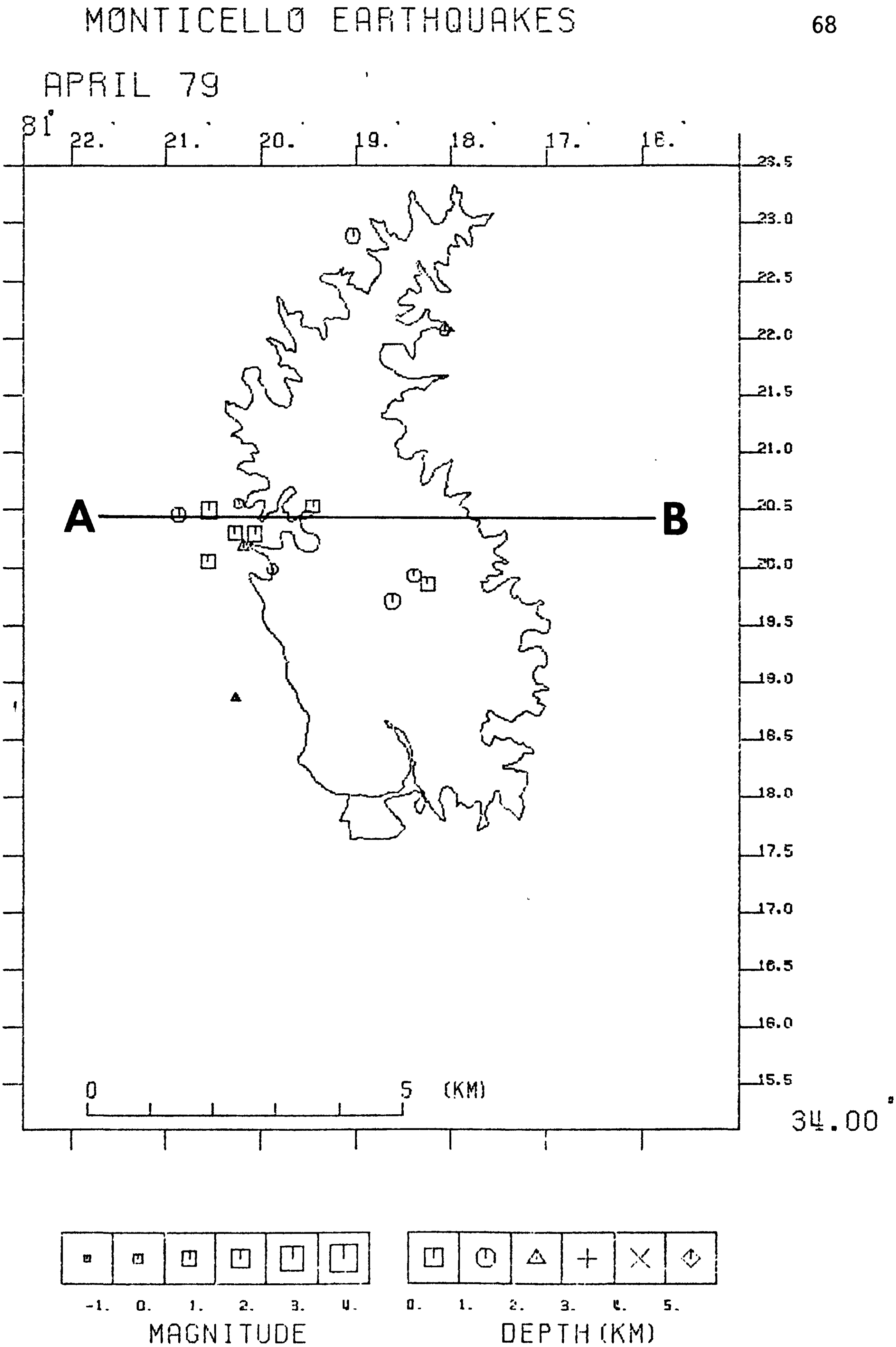

MONTICELLO EARTHQUAKES
APRIL 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22K

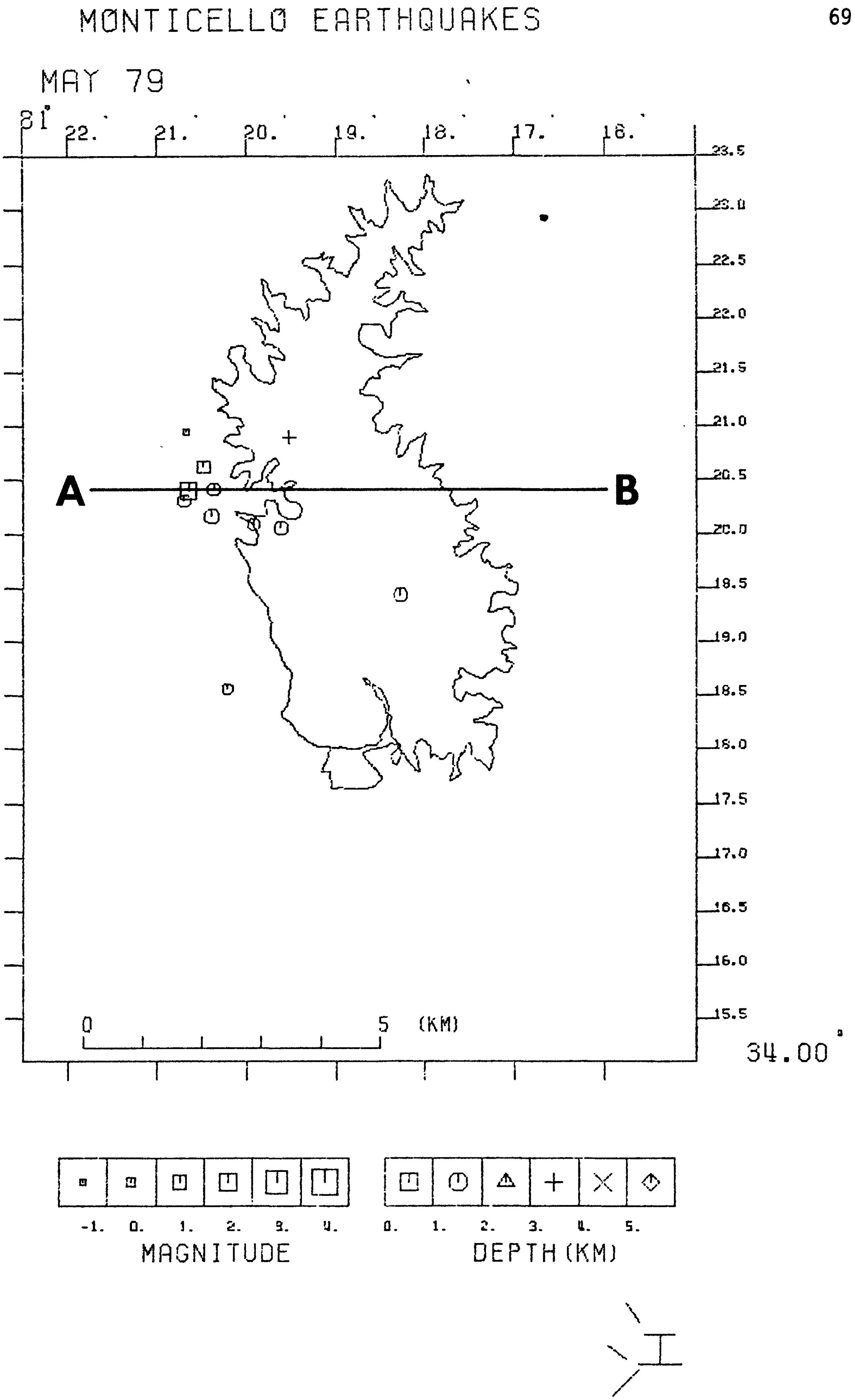
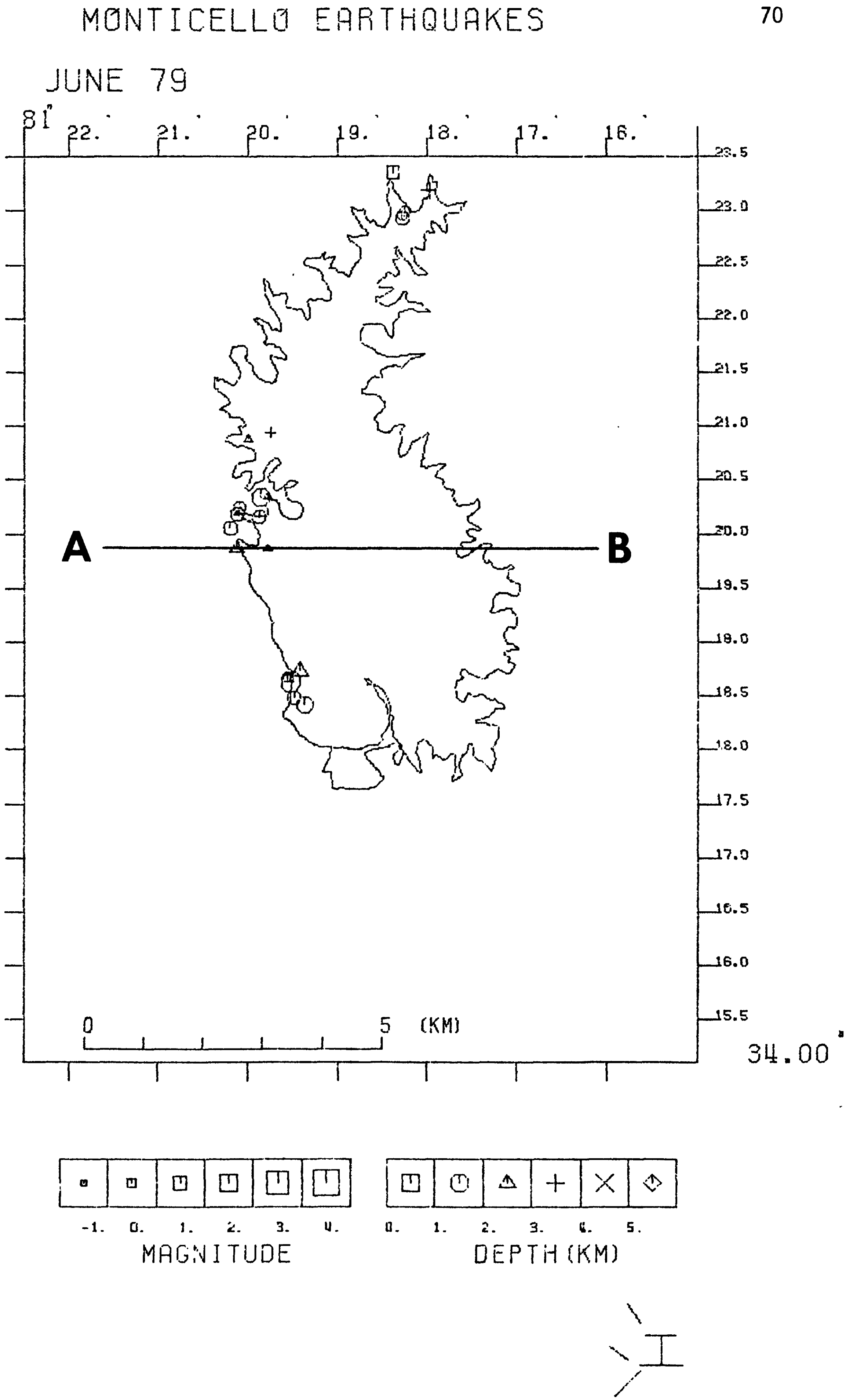

MONTICELLO EARTHQUAKES
MAY 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22L



MONTICELLO EARTHQUAKES
JUNE 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22M

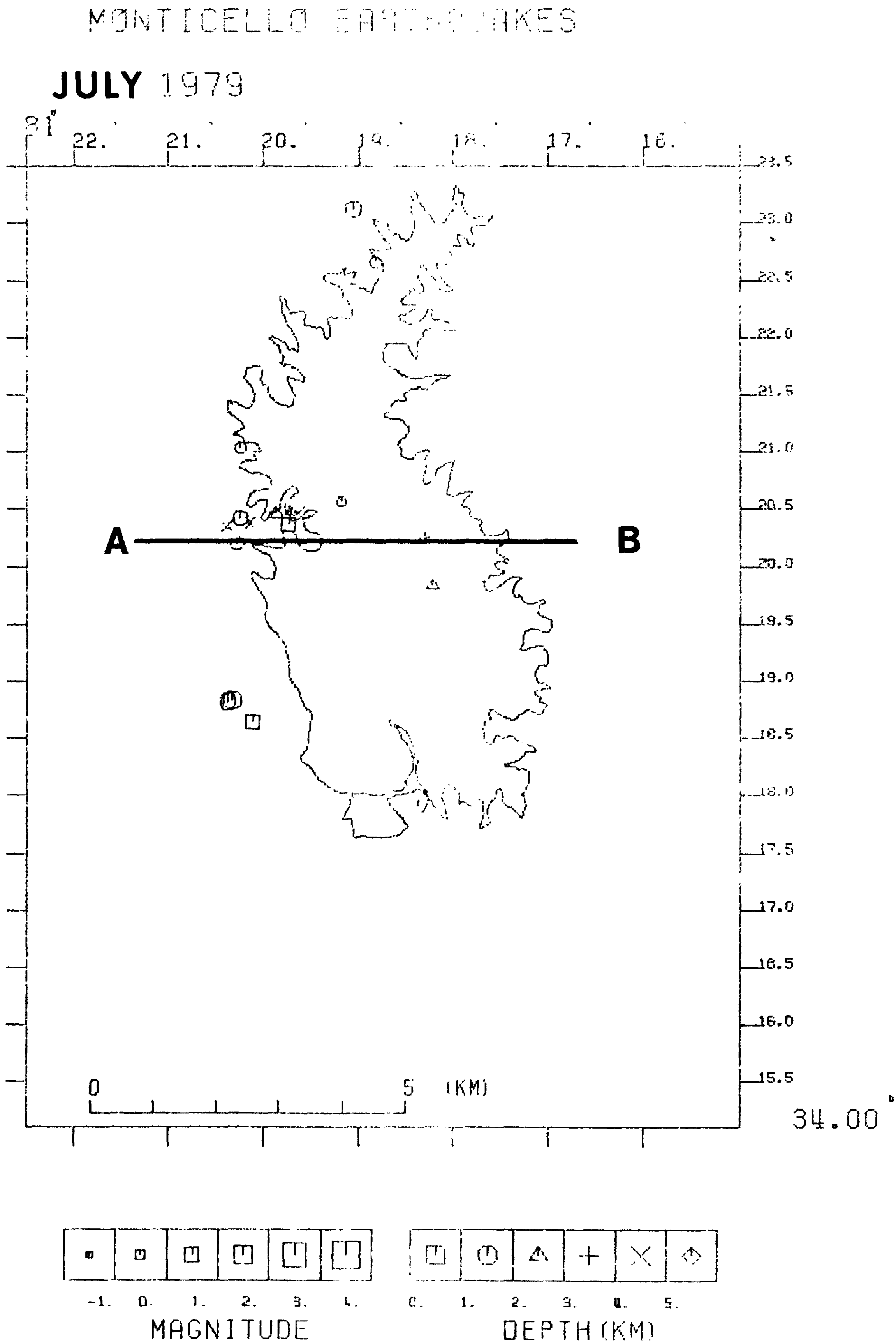

MONTICELLO EARTHQUAKES
JULY 1979
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
34.00°
A
B
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22N

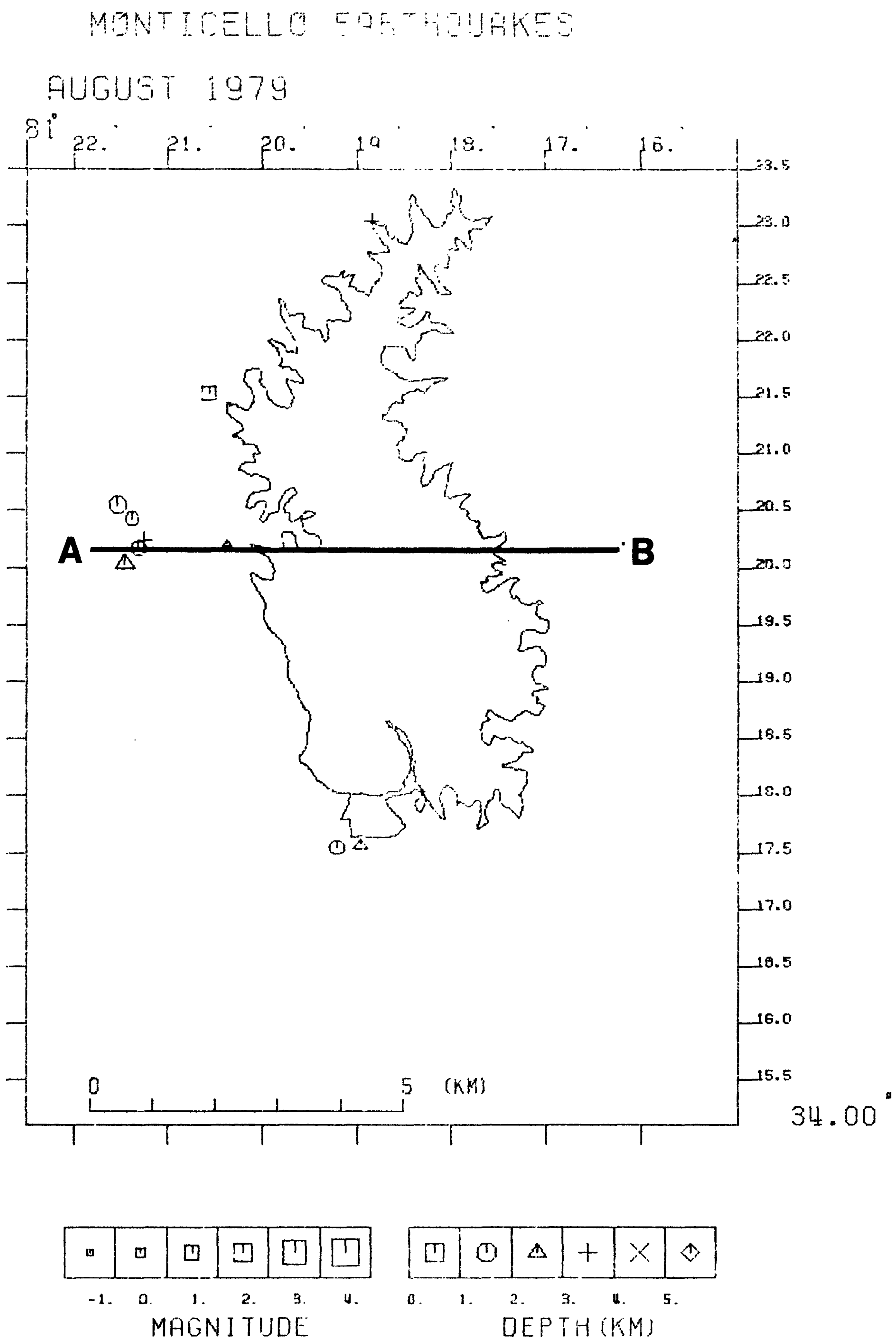

MONTICELLO EARTHQUAKES
AUGUST 1979
81°
22.
21.
20.
19
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22-0

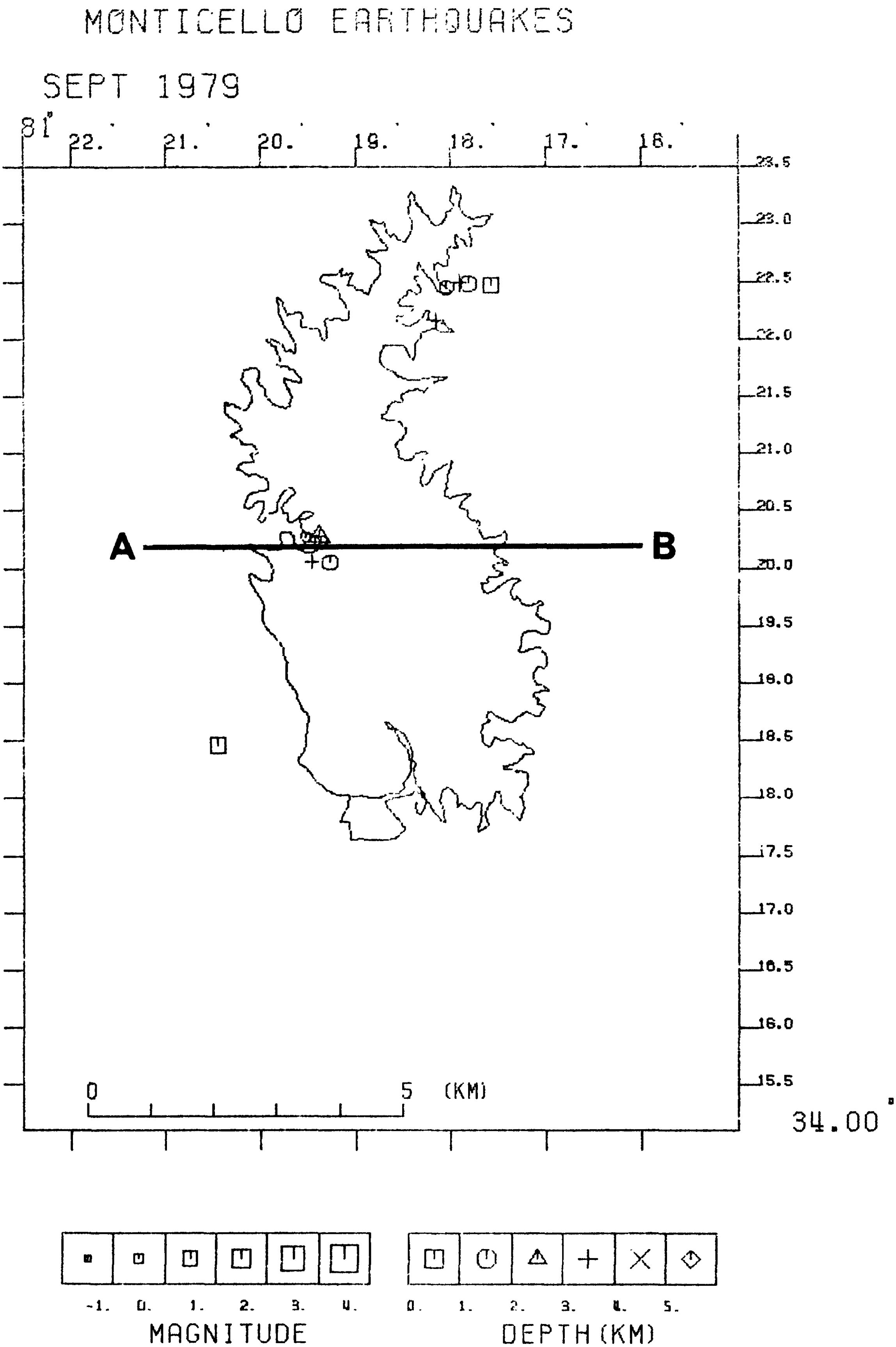

MONTICELLO EARTHQUAKES
SEPT 1979
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
34.00°
A
B
0
5 (KM)
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 22P

TABLE 6

MONTHLY NUMBER OF EARTHQUAKES

FROM JUNE 1978 TO SEPTEMBER 1979

		RECORDED	LOCATED	$M \geq 2.0$
1978	June	109	67	1
	July	80	80	
	August	91	68	2
	September	221	24	2
	October	196	80	6
	November	227	56	3
	December	127	41	1
1979	January	67	18	
	February	46	28	3
	March	28	15	
	April	21	16	
	May	37	14	
	June	47	27	2
	July	58	17	
	August	26	12	1
	September	36	11	1

TABLE 7

LIST OF MONTICELLO EVENTS ($M_L \geq 2.0$) - APRIL 1978 - SEPTEMBER 1979

	DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
1	780422	136 23.99	34-22.29	81-18.59	1.92	2.64	5	255	4.6	0.07	2.8	3.7	D1
2	780617	410 51.65	34-19.85	81-19.41	0.71	2.05	6	130	2.6	0.03	0.3	3.3	B1
3	780827	1023 7.98	34-18.78	81-20.21	1.82	2.67	7	148	2.9	0.10	2.3	7.7	C1
4	780827	1058 16.84	34-19.85	81-18.73	7.33	2.45	4	166	1.5	0.02			C1
5	780907	1239 28.64	34-20.65	81-20.77	0.43	2.00	9	137	4.8	0.11	0.3	1.4	B1
6	780915	1228 1.66	34-18.18	81-20.06	0.45	2.05	7	154	4.8	0.06	0.4	2.3	C1
7	781001	1224 34.66	34-21.02	81-20.59	0.01	2.00	5	142	4.8	0.03	0.5	32.7	D1
8	781003	939 4.33	34-18.19	81-20.05	1.80	2.25	5	154	7.3	0.06	0.8	5.3	D1
9	781017	547 46.75	34-18.31	81-20.40	2.12	2.22	5	155	5.0	0.00	0.0	0.2	C1
10	781024	1836 48.00	34-20.23	81-19.91	0.07	2.33	5	128	3.4	0.07	0.8	6.8	D1
11	781025	1614 40.48	34-16.90	81-20.25	1.00	2.20	5	170	6.8	0.20	3.0	67.0	D1
12	781027	726 2.43	34-17.86	81-20.18	0.23	2.41	5	158	5.3	0.02	0.3	2.4	C1
13	781027	1627 18.10	34-18.09	81-19.55	1.95	2.91	5	151	4.4	0.02	0.4	1.5	C1
14	781124	1154 40.89	34-17.77	81-20.84	0.45	2.33	5	165	6.2	0.01	0.1	0.6	C1
15	781124	1344 3.47	34-18.45	81-20.50	0.47	2.25	6	154	5.0	0.04	0.3	1.4	B1
16	781125	321 4.28	34-20.19	81-20.60	1.77	2.16	7	132	4.4	0.08	0.6	2.9	B1
17	781203	1649 40.09	34-19.88	81-18.70	0.13	2.13	6	139	1.5	0.04	0.3	1.1	B1
18	790201	125 48.44	34-19.82	81-19.04	1.12	2.61	5	128	2.0	0.02	0.3	1.0	C1
19	790216	1437 9.12	34-20.42	81-20.25	0.12	2.72	5	132	4.0	0.02	0.0	0.1	C1
20	790220	2320 45.55	34-19.32	81-21.32	1.94	2.25	5	171	5.6	0.07	1.1	6.6	D1
21	790605	937 44.23	34-18.57	81-19.54	1.92	2.41	6	145	3.7	0.08	0.7	2.9	C1
22	790605	940 2.10	34-18.67	81-19.44	2.79	2.33	7	144	3.5	0.06	0.4	1.3	B1
23	790807	1932 17.20	34-19.99	81-21.46	2.85	2.55	5	140	5.7	0.01	0.2	0.8	C1
24	790914	045 31.40	34-20.24	81-19.41	2.44	2.66	5	127	2.6	0.01	0.2	0.5	C1

Two earthquakes of $M_L \geq 2.0$ occurred on June 5, 1979, near the southwestern margin of the reservoir. Some earthquakes were also located in W and N subareas (Figure 22M).

In August 1979, a M 2.6 earthquake and associated seismicity occurred 2 - 3 km away from the reservoir margin in subarea W (Figure 22-O).

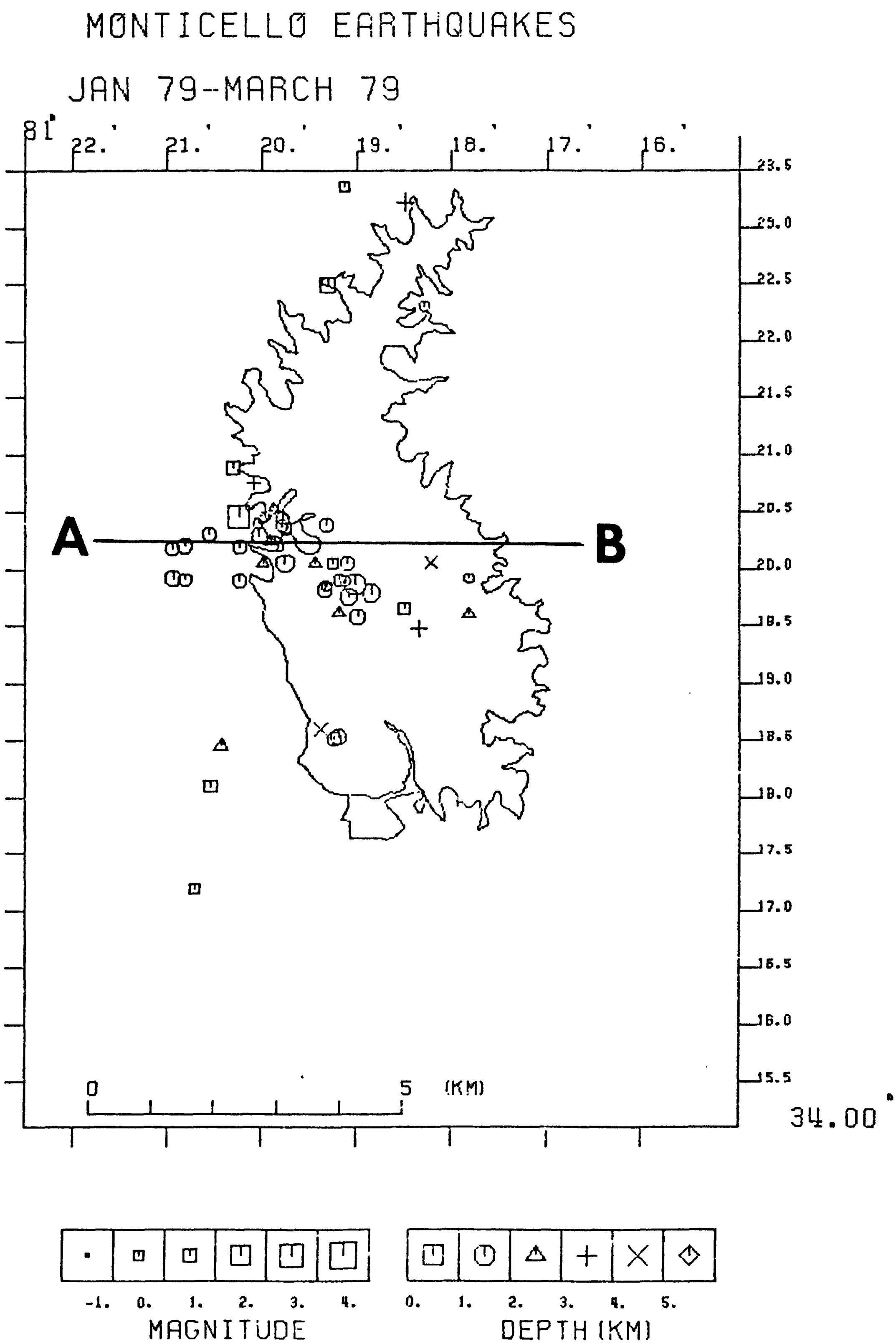
In September 1979, a M 2.7 earthquake occurred in area C, near the western margin of the reservoir (Figure 22P).

The three-monthly plots January - March, April - June, and July - September 1979 are shown in Figures 23, 24 and 25 and the corresponding cross sections are shown in 23A, 24A and 25A. The monthly distribution of energy and depth of the events in different subareas N, NW, W, C, E, SW and S is shown in Figures 26A - P for the period December 1977 to March 1979.

IV.4. *Seismicity and Water Levels at Monticello*

The strong relationship between water level at the time of initial filling and seismic activity was described in the 7th report.

Full pond elevation was achieved on February 8, 1978, after which the reservoir level has been changed by a maximum of 5 feet per day. Monticello reservoir is a pumped storage facility and the decrease in reservoir levels associated with power generation is recovered when water is pumped back into the reservoir. Correspondingly there can be variations up to about 5 feet per day between the maximum and minimum water levels. To check on any affect of these small water level changes in seismicity, we plot the maximum and minimum water levels together with the daily energy release and daily number of located events into three groups for the period January



MONTICELLO EARTHQUAKES
JAN 79-MARCH 79
81
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5
(KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 23

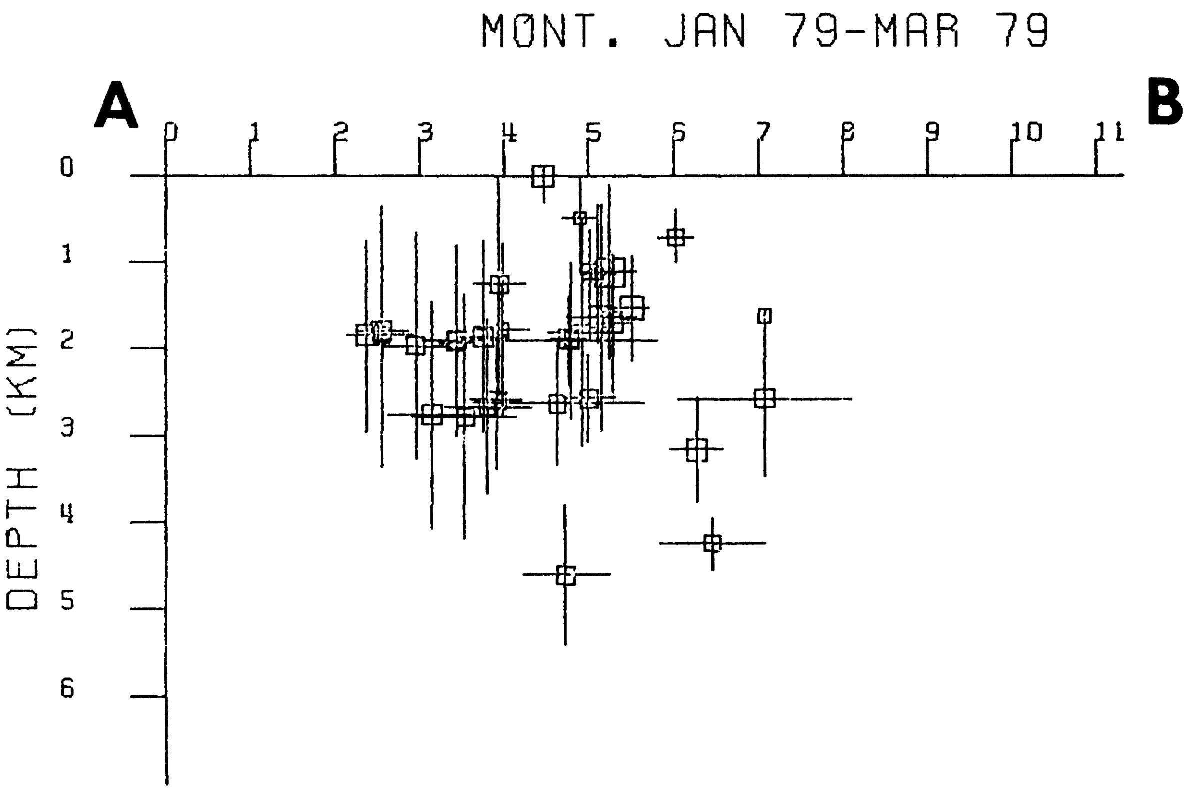


Figure 23A

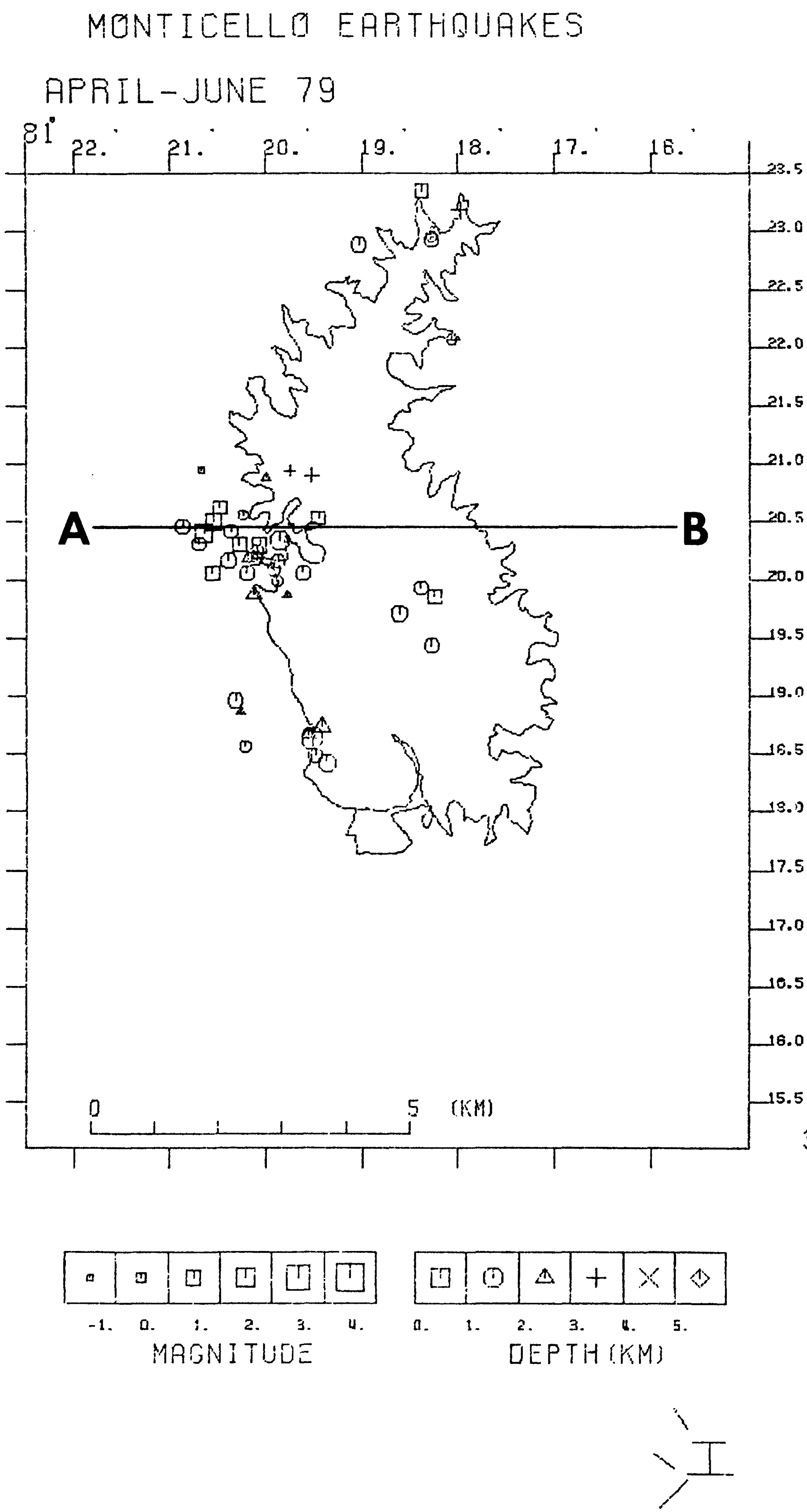

MONTICELLO EARTHQUAKES
APRIL-JUNE 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
0
5 (KM)
34.00°
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 24

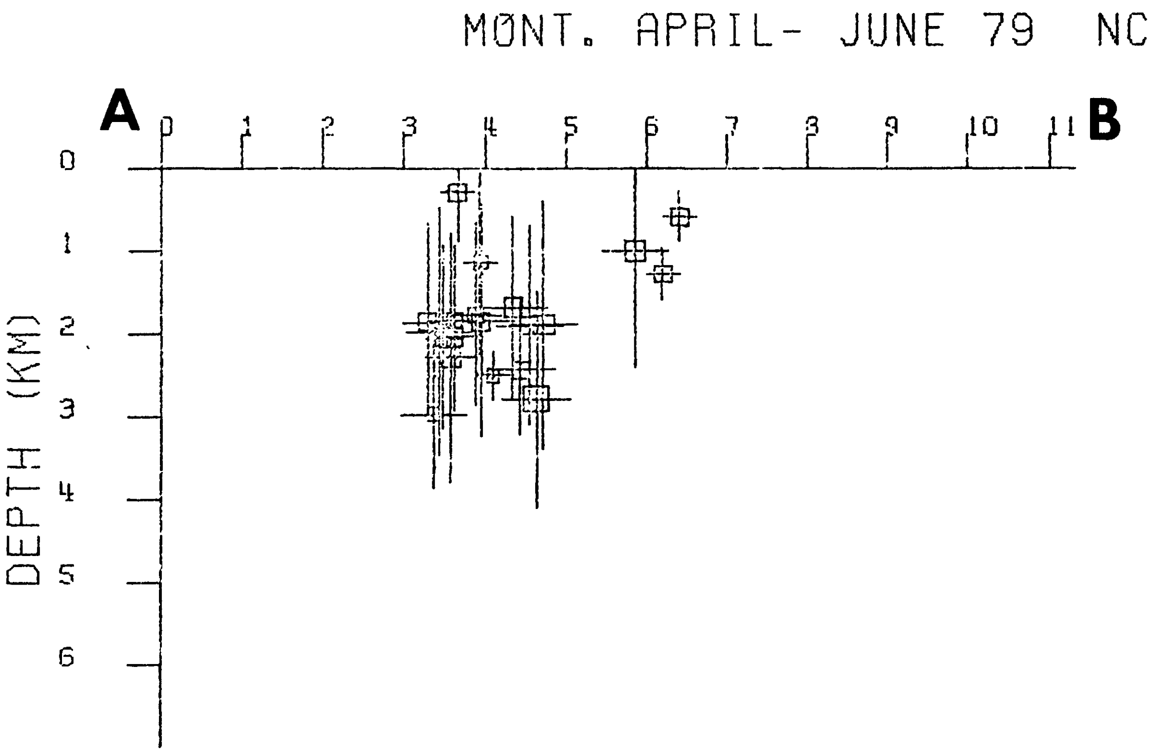


Figure 24A

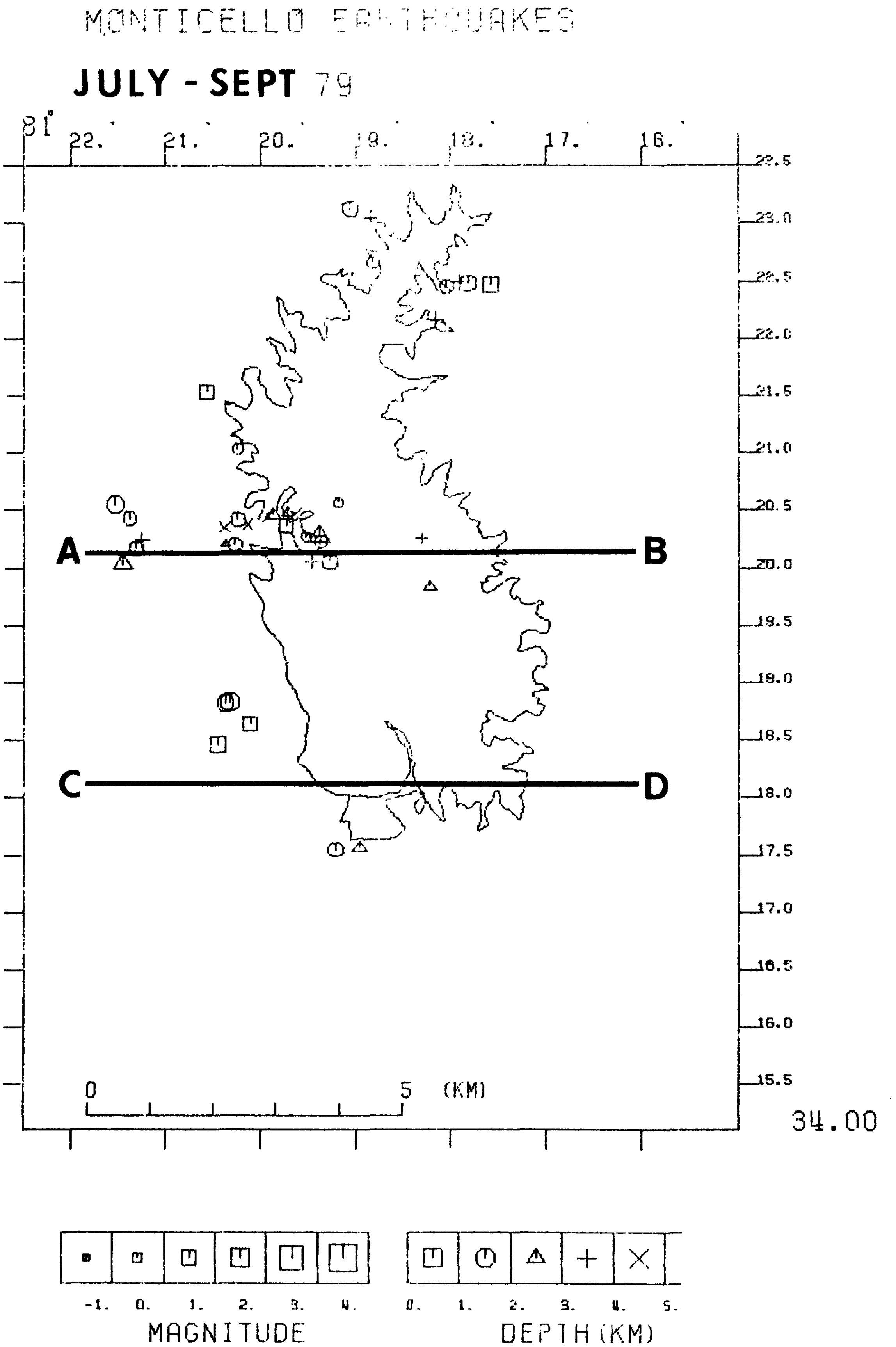
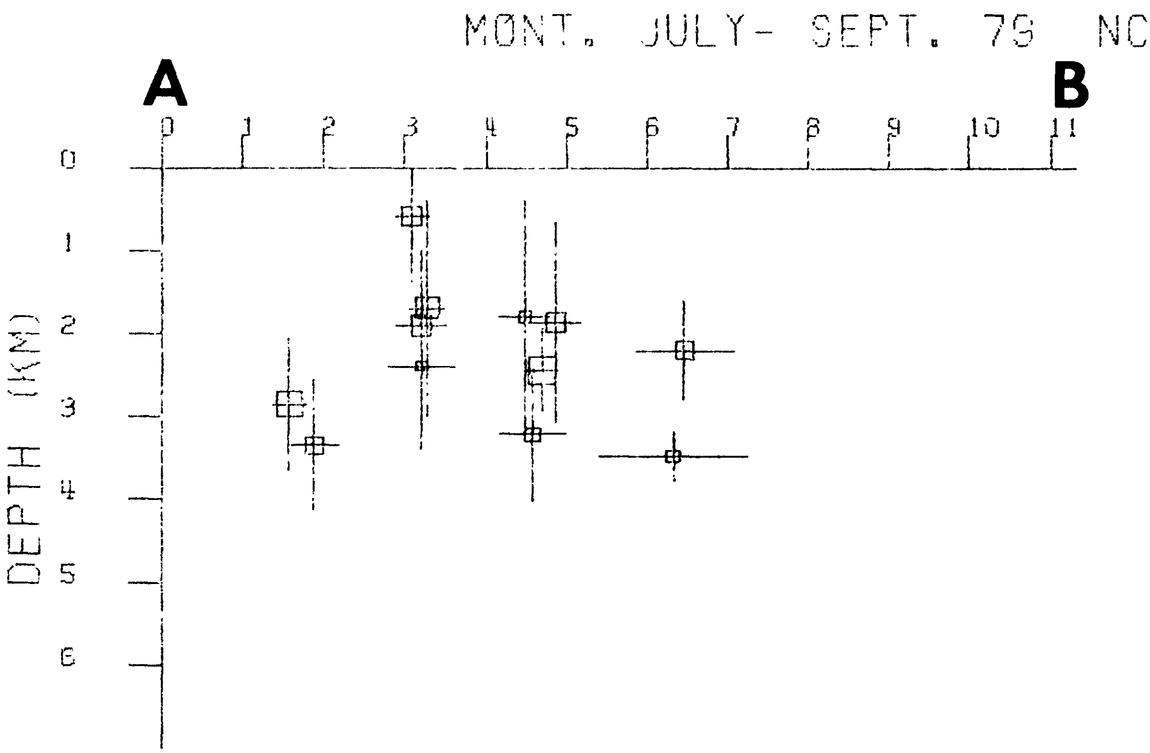

MONTICELLO EARTHQUAKES
JULY - SEPT 79
81°
22.
21.
20.
19.
18.
17.
16.
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
A
B
C
D
0
5 (KM)
34.00
-1.
0.
1.
2.
3.
4.
MAGNITUDE
0.
1.
2.
3.
4.
5.
DEPTH (KM)

Figure 25


MONT. JULY- SEPT. 79 NC
A
B
0
1
2
3
4
5
6
7
8
9
10
11
DEPTH (KM)

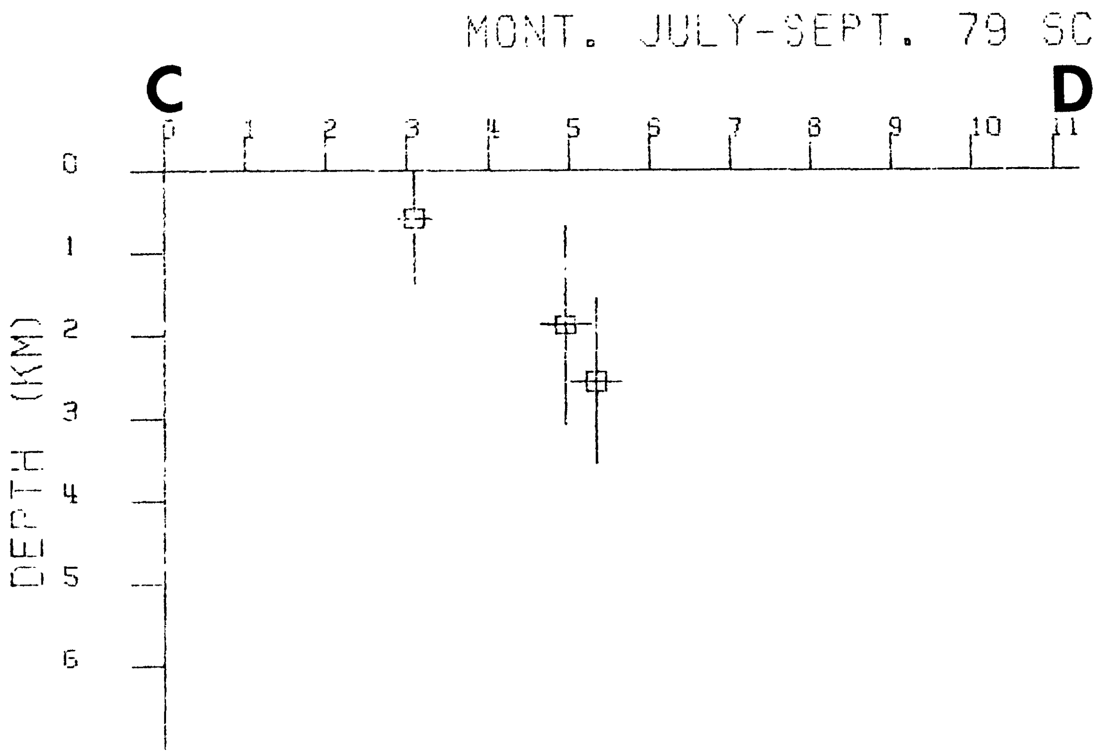

MONT. JULY-SEPT. 79 SC
C
D
0
1
2
3
4
5
6
7
8
9
10
11
DEPTH (KM)

Figure 25A

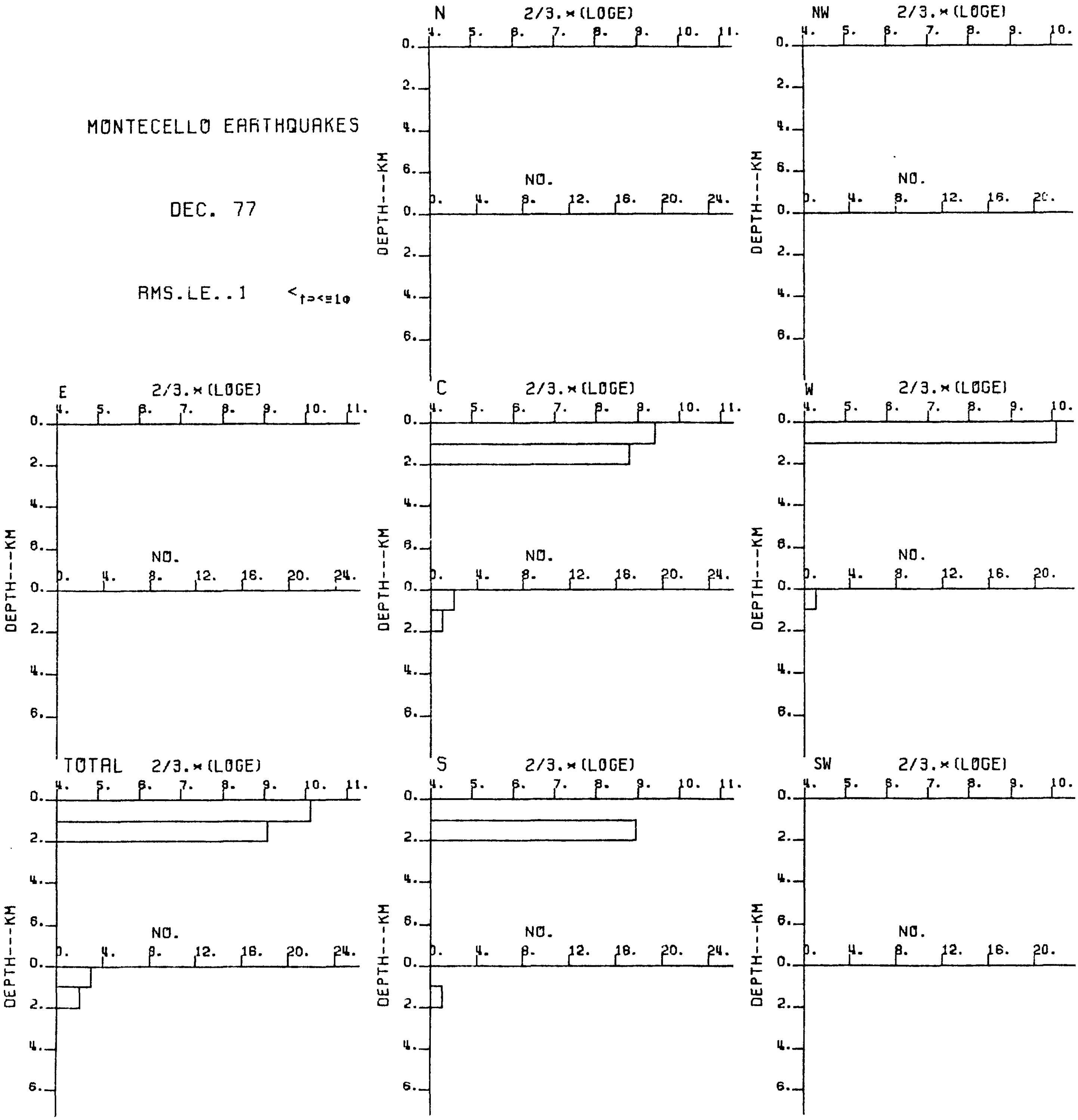
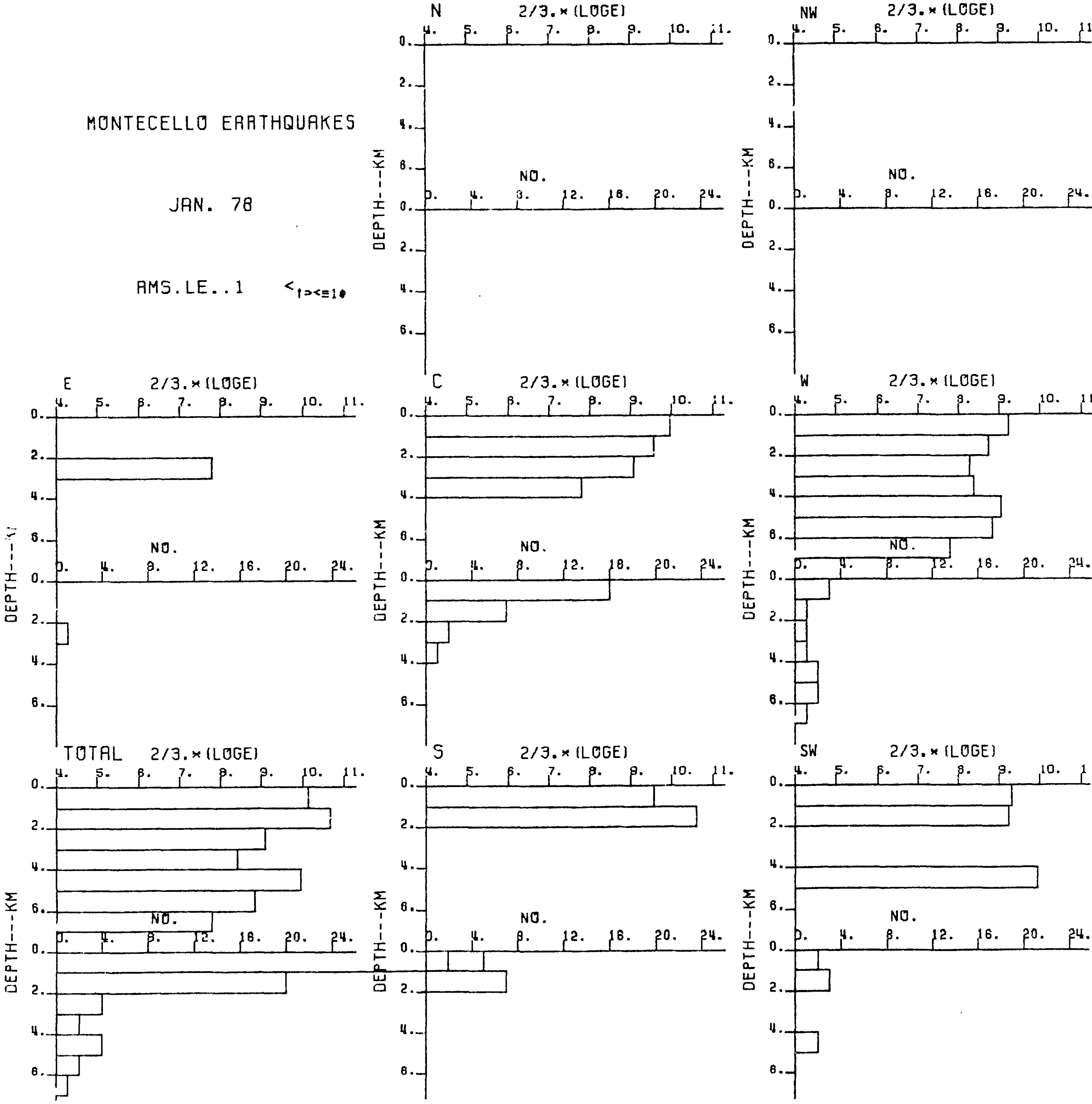

MONTECELLO EARTHQUAKES
DEC. 77
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM
0.
2.
4.
6.
4. 5. 6. 7. 8. 9. 10. 11.
0. 4. 8. 12. 16. 20. 24.

Figure 26A



MONTECELLO EARTHQUAKES
JAN. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26B

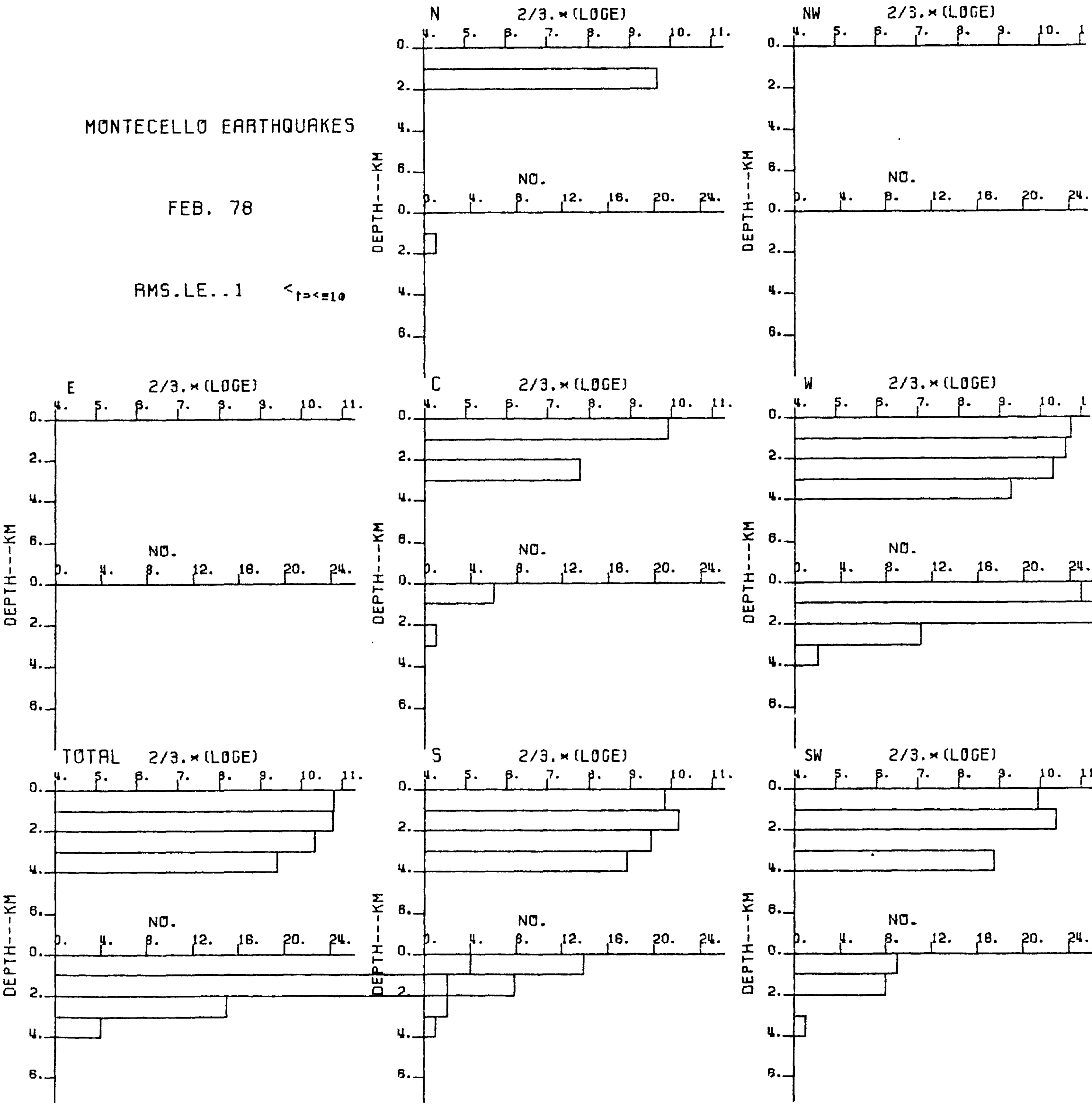

MONTECELLO EARTHQUAKES
FEB. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26C

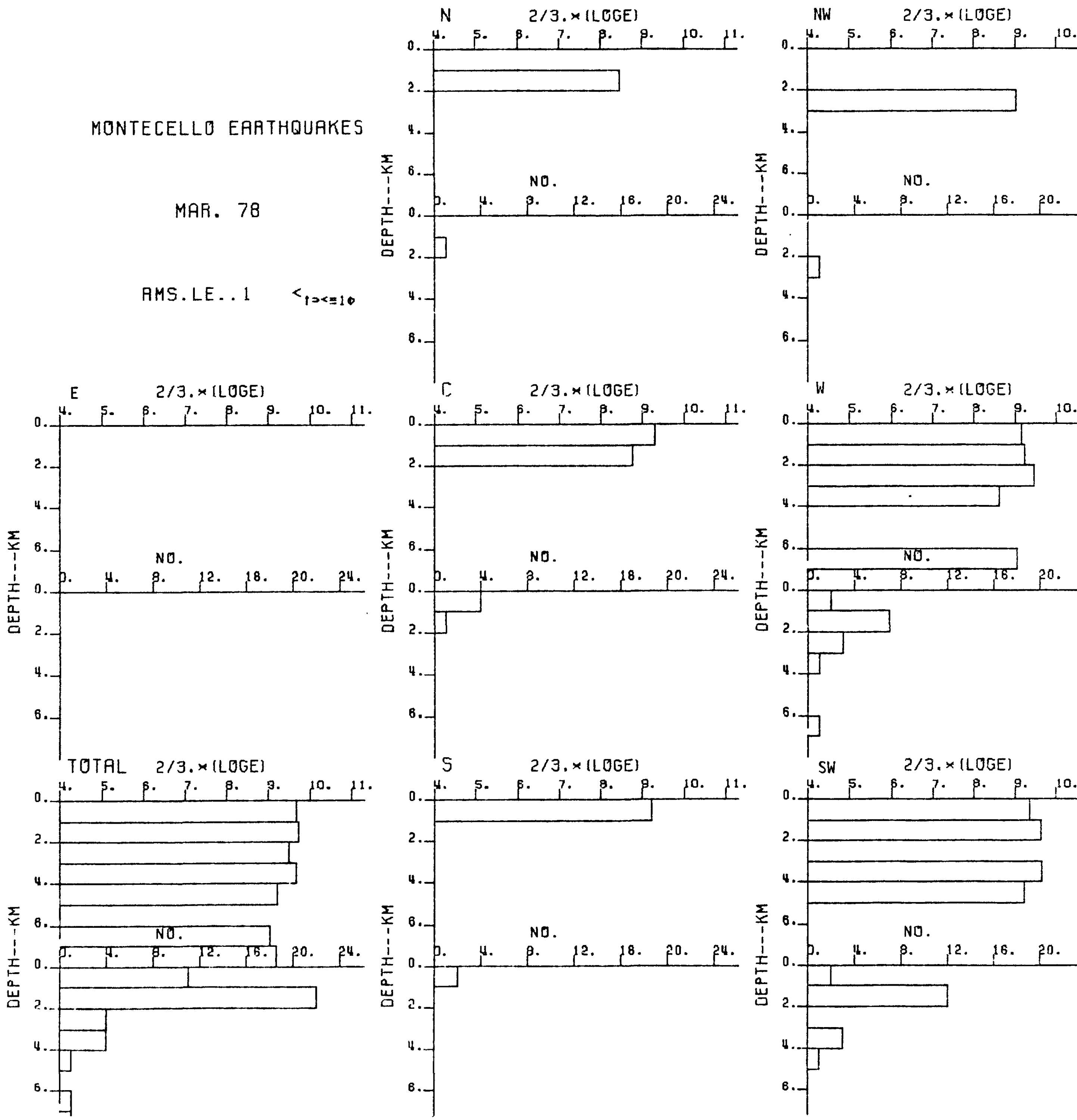

MONTECELLO EARTHQUAKES
MAR. 78
AMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH---KM

Figure 26D

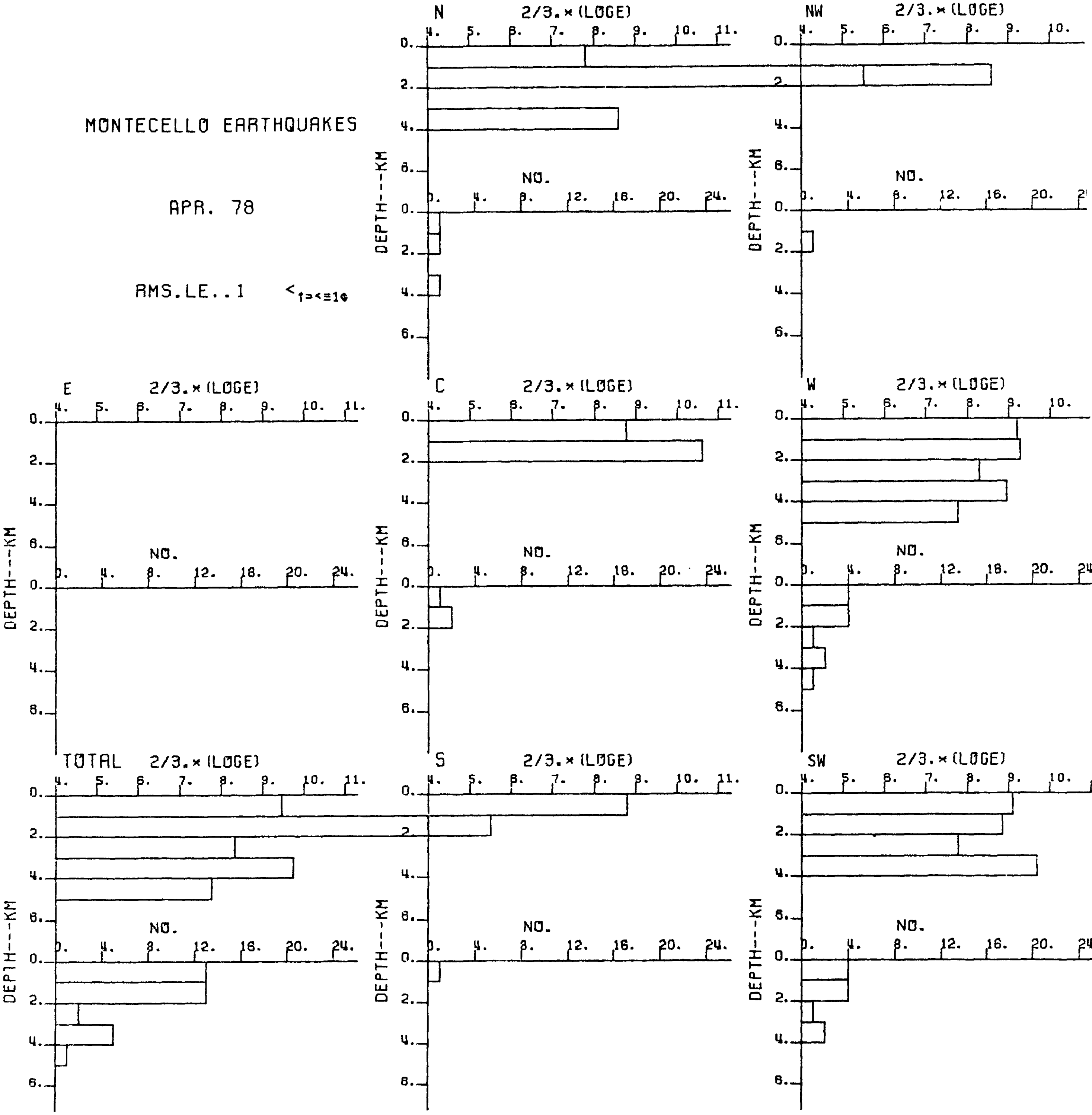
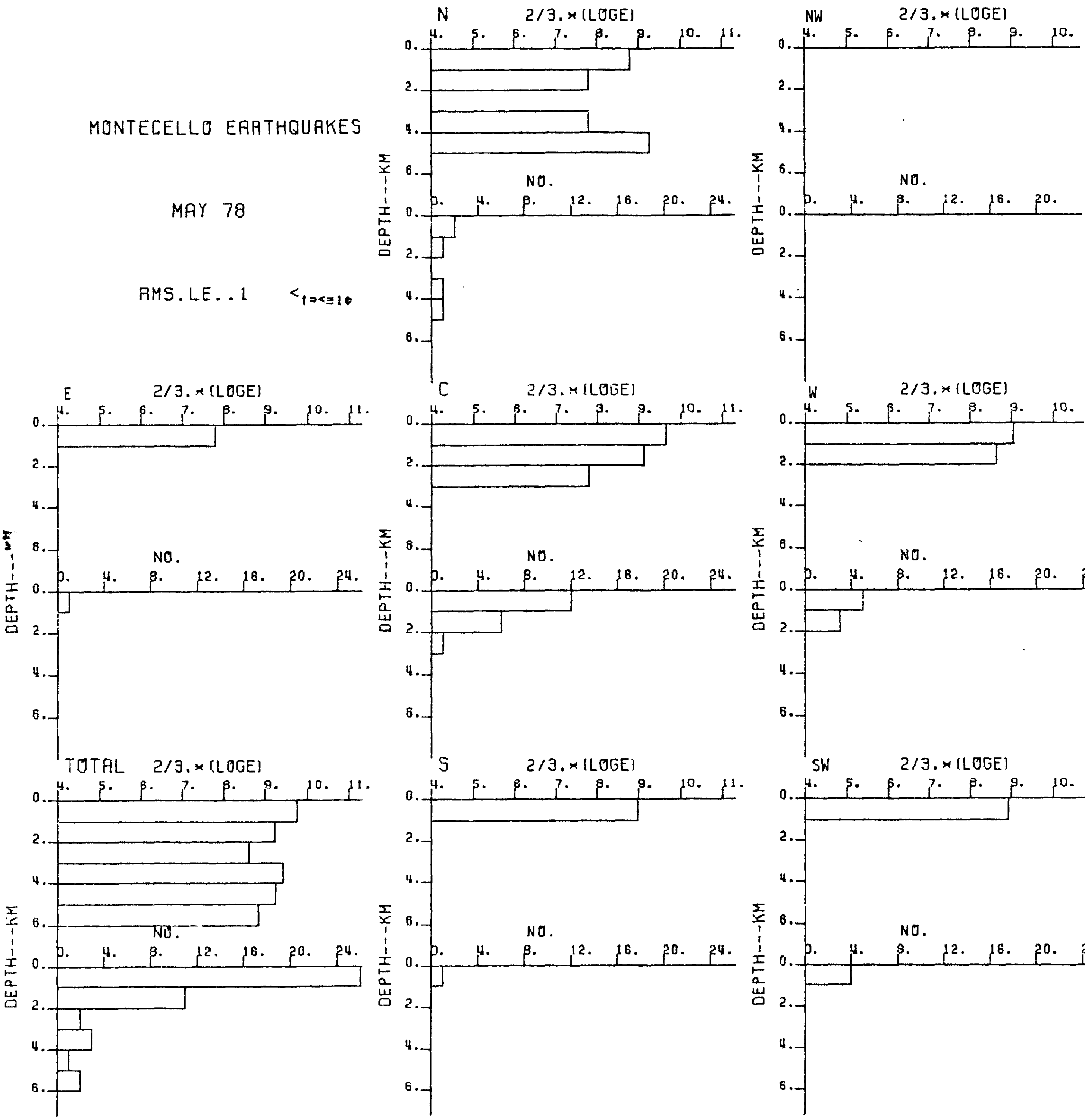

MONTECELLO EARTHQUAKES
APR. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH---KM

Figure 26E



MONTECELLO EARTHQUAKES
MAY 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26F

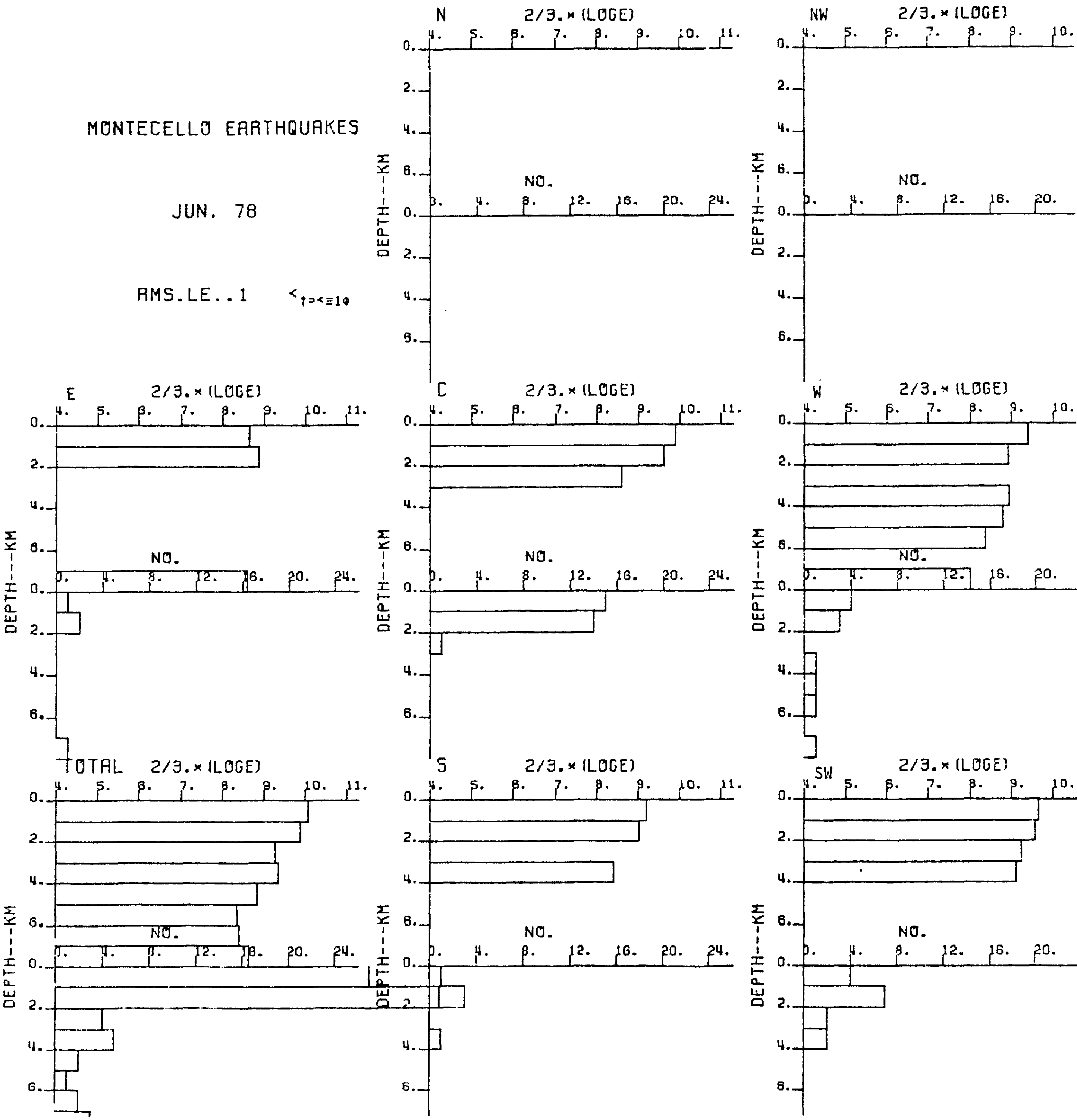
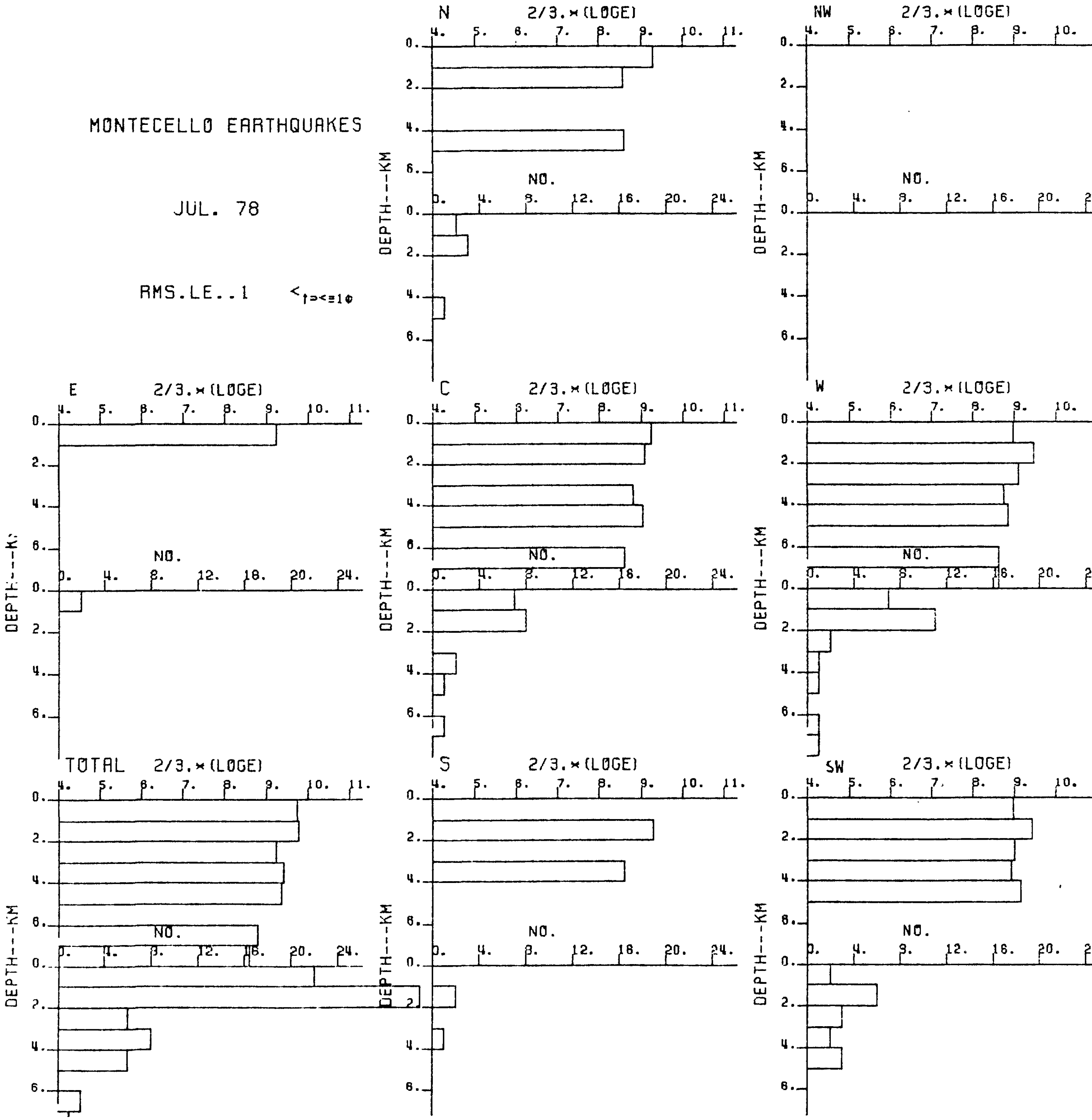

MONTECELLO EARTHQUAKES
JUN. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH---KM

Figure 26G



MONTECELLO EARTHQUAKES
JUL. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26H

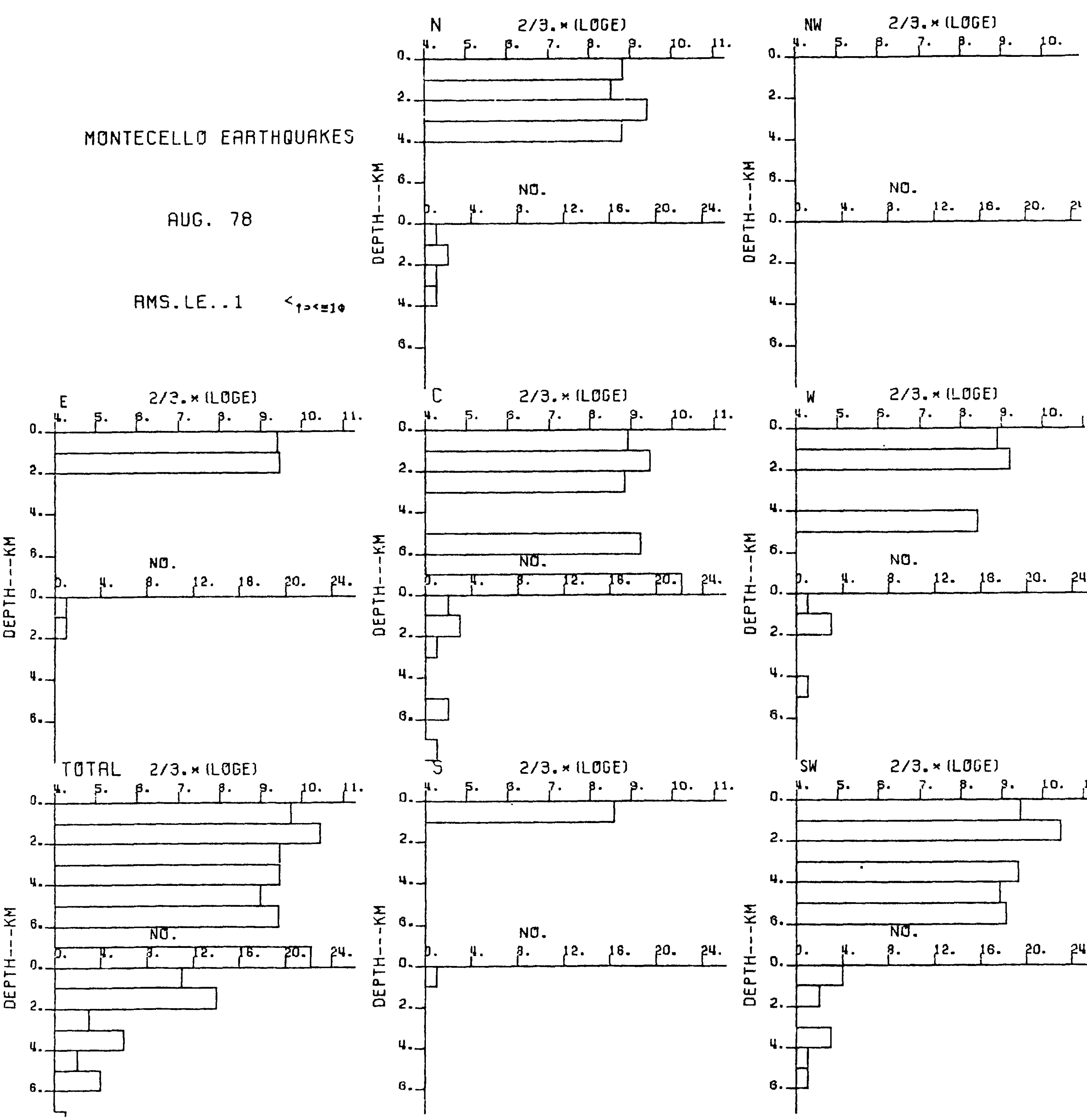
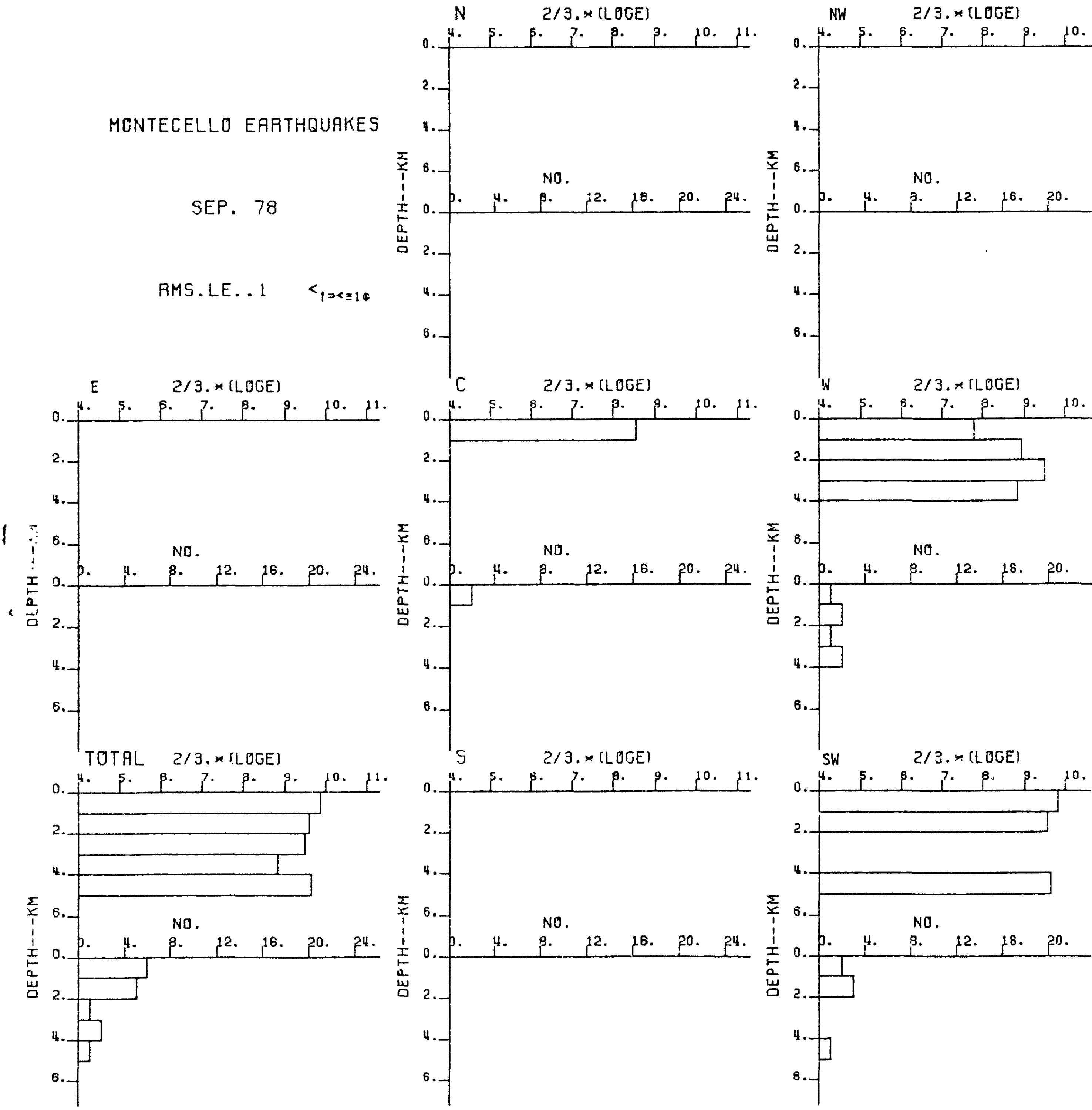

MONTECELLO EARTHQUAKES
AUG. 78
AMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH---KM

Figure 26I



MONTECELLO EARTHQUAKES
SEP. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26J

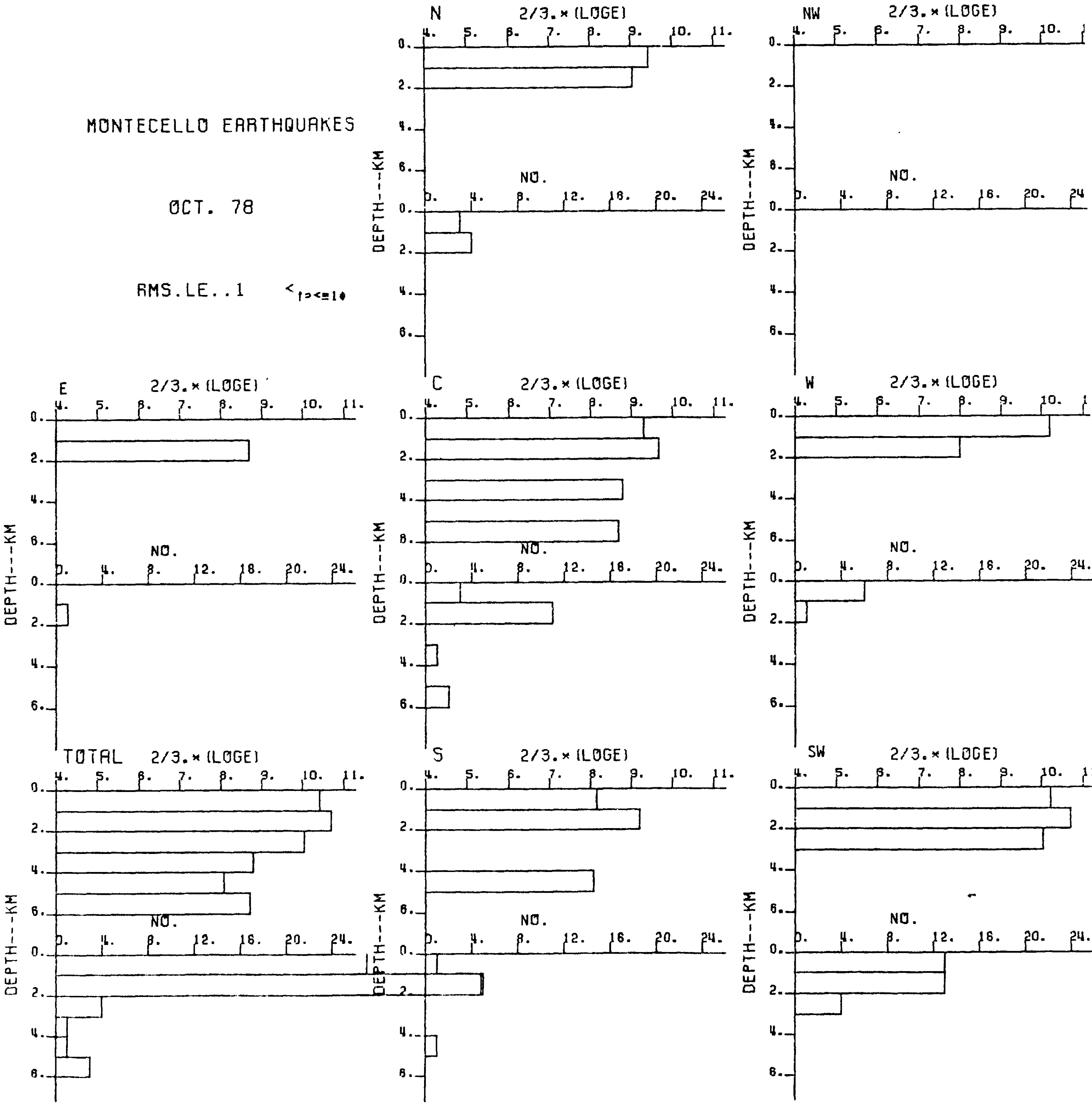

MONTECELLO EARTHQUAKES
OCT. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH--KM

Figure 26K

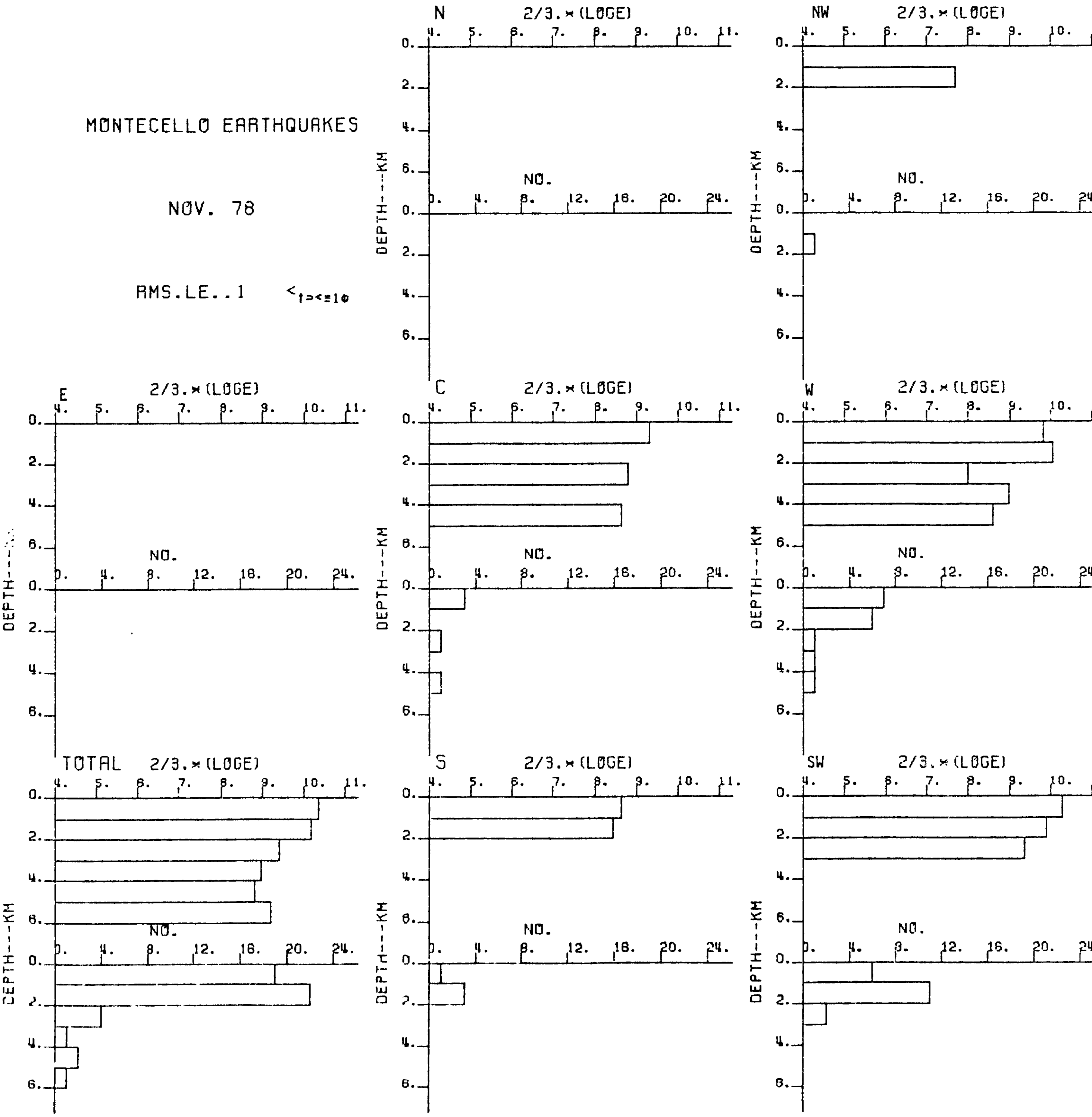

MONTECELLO EARTHQUAKES
NOV. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26L

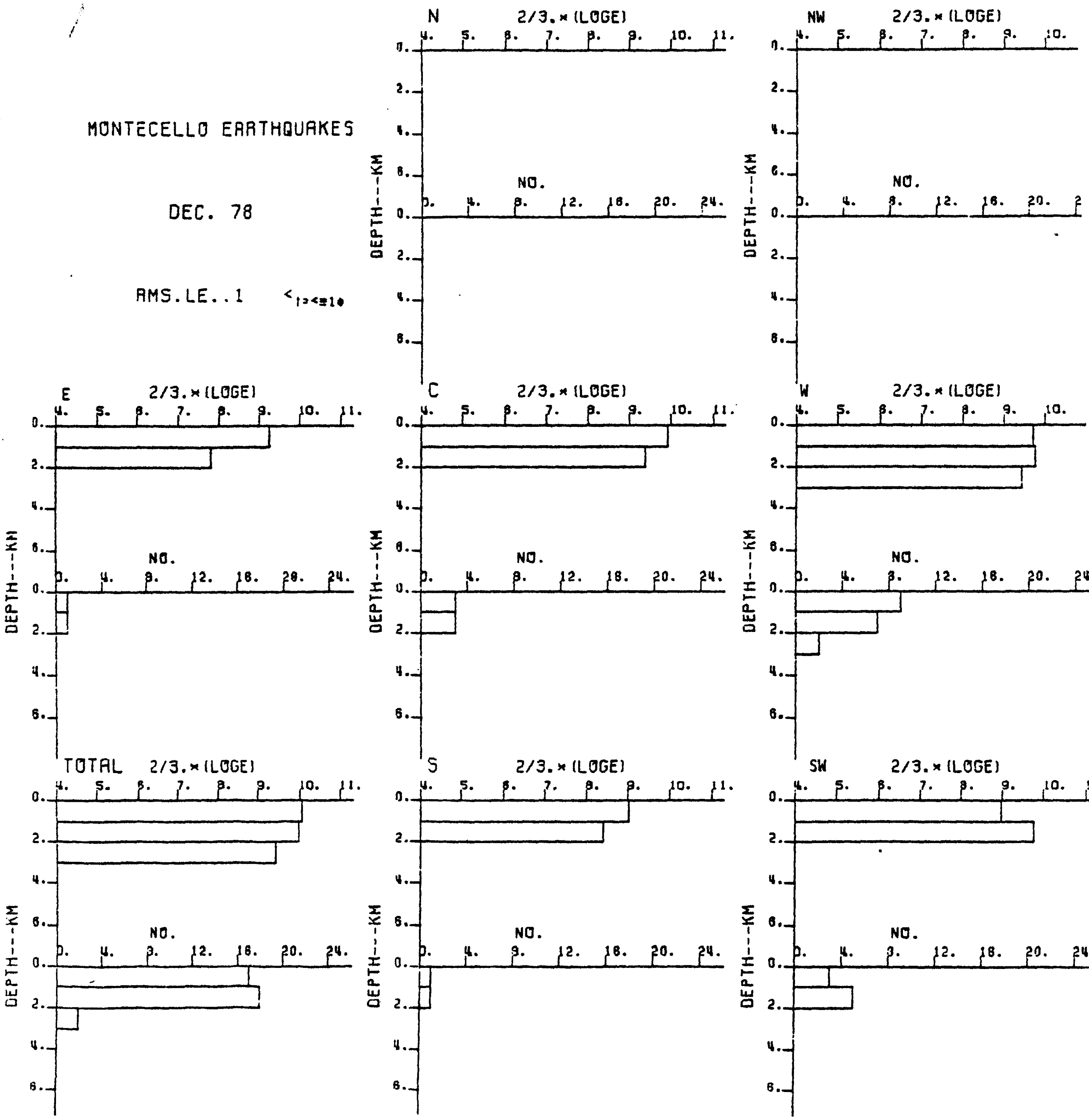

MONTECELLO EARTHQUAKES
DEC. 78
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26M

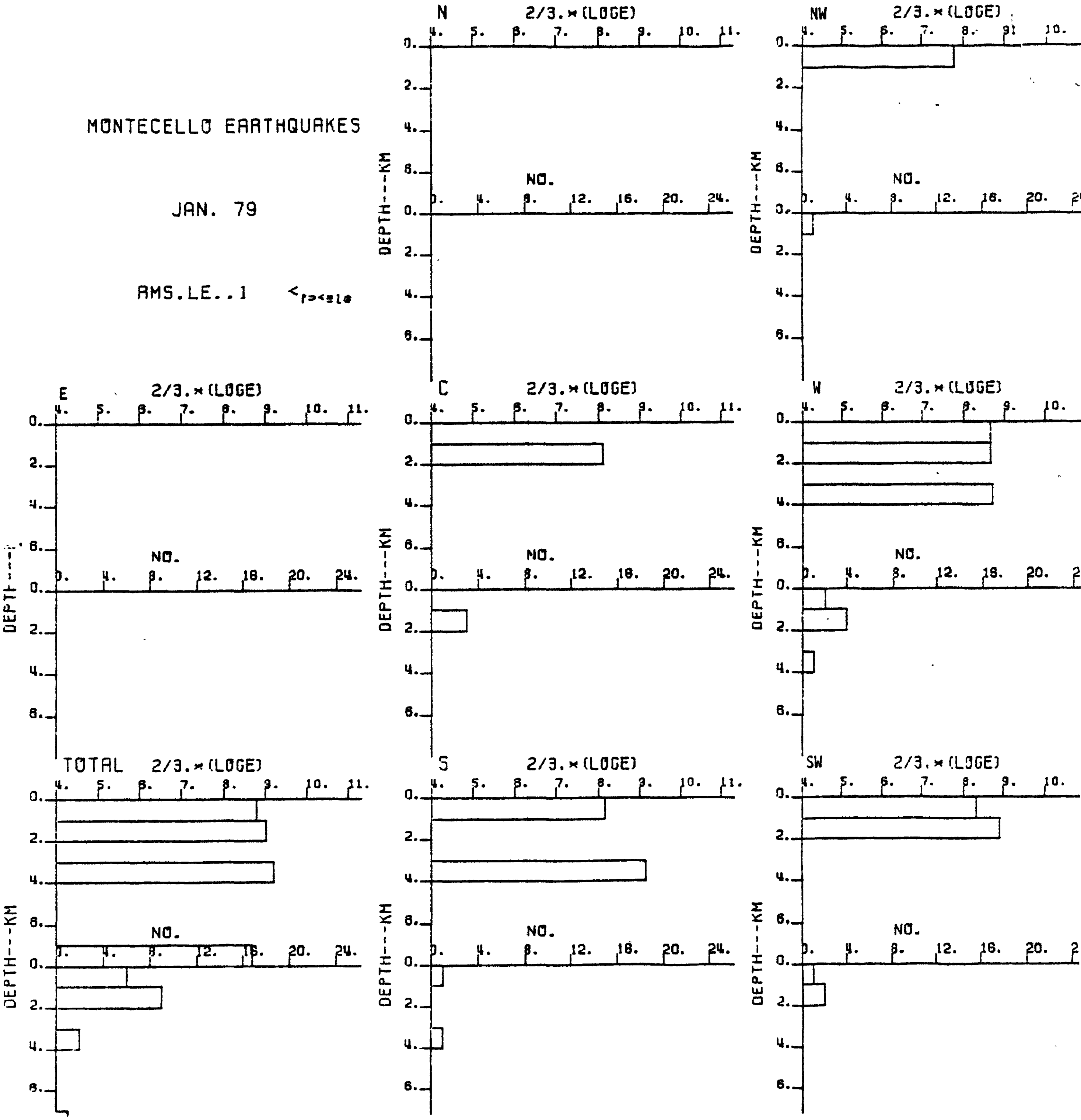

MONTECELLO EARTHQUAKES
JAN. 79
AMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26N

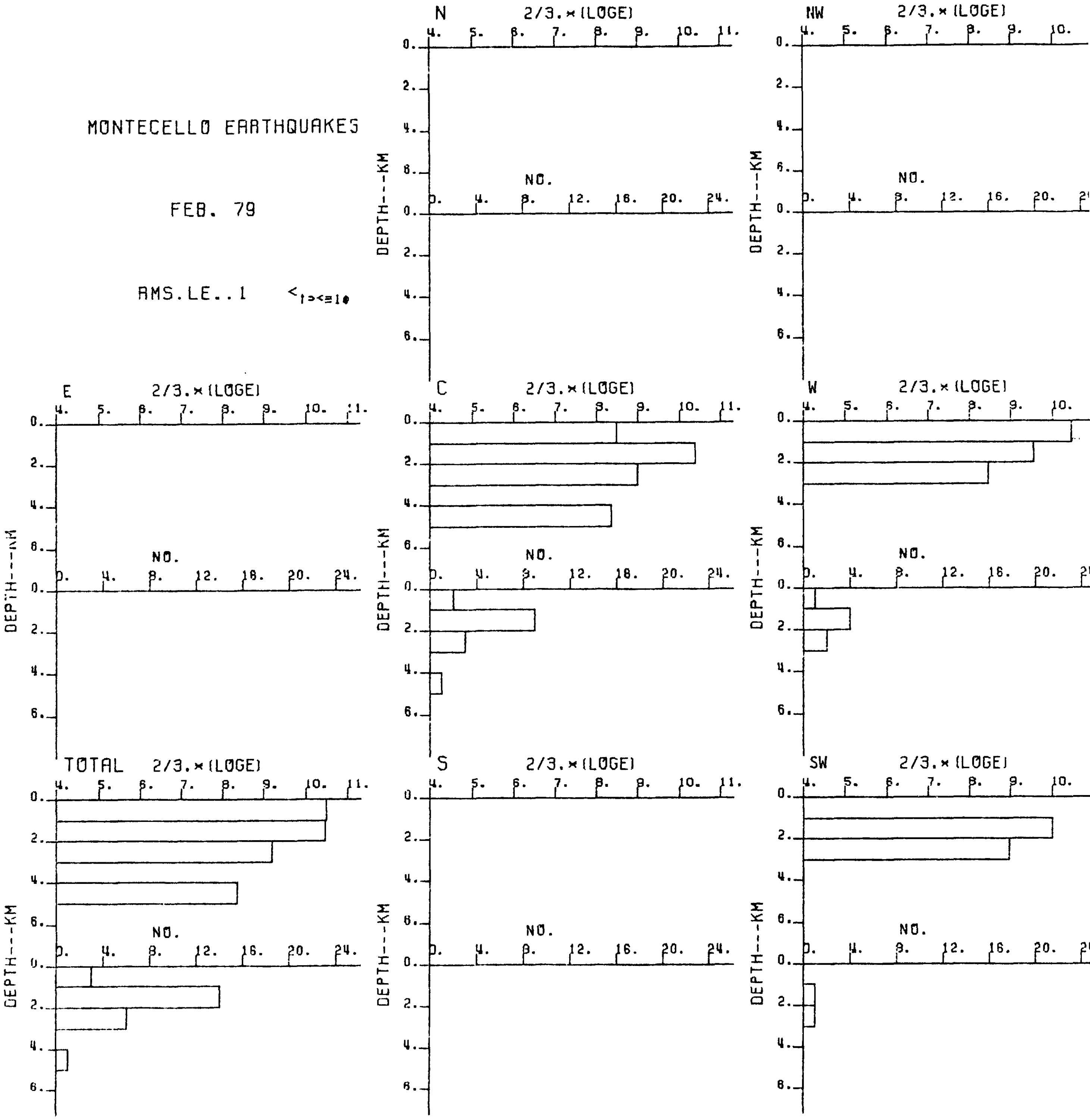

MONTECELLO EARTHQUAKES
FEB. 79
AMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.×(LOGE)
NO.
DEPTH---KM

Figure 26-0

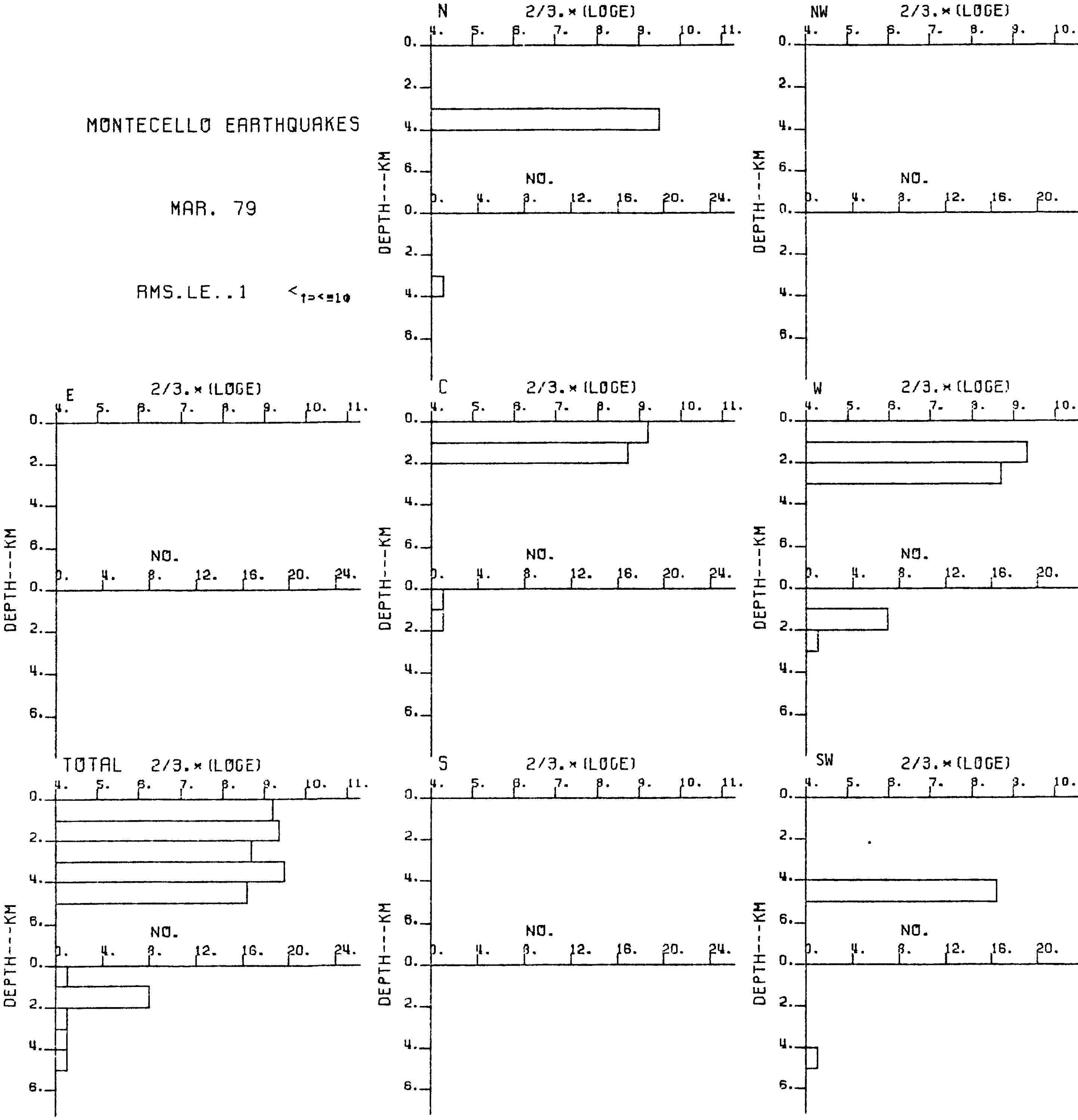

MONTECELLO EARTHQUAKES
MAR. 79
RMS.LE..1
N
NW
E
C
W
TOTAL
S
SW
2/3.*(LOGE)
NO.
DEPTH---KM

Figure 26P

through September 1979. Only the events with 10 sec duration ($M_L \sim 0.2$) were considered, as seismic energy associated with smaller events is significantly smaller.

For the period January - March 1979, there were three large events ($M_L > 2$) on February 1, 16 and 20. These occurred after significant rise in the minimum water level curve starting on January 16, suggesting a possible association (Figure 27). These observations suggest that perhaps a deferred effect due to pore-pressure diffusion was in effect. To test this idea, the minimum water level in the reservoir was shifted by 20 days and replotted on the energy curve. We note a gross similarity between the two curves. These observations suggest that the seismic energy release is related to the lake level and follows it by about three weeks.

For the period April - June 1979 (Figures 28 and 29), there were very small fluctuations in the water level in April. These were followed by more rapid fluctuations in both the maximum and minimum water levels in May and June 1979. There also appears to be a general increase in the seismicity level in May and June with two $M_L > 2.0$ events occurring on June 5, 1979 (Figure **28**). The peaks in seismic energy release ($\geq 10^{13}$ ergs/day) were compared with water levels. There is a suggestion that seven seismicity peaks occur after 7 days of peaks in the *maximum* water level (Figure 29). The corresponding peaks have been numbered. We then attempted to relate the delay to the hypocentral distance of the event from the lake edge. Preliminary data suggest a linear relationship.

Figure 30 shows the comparison of water level to seismicity for the period July - September 1979. The top two graphs show the water level and also the change of water level per day. The log energy per day and number of events per day are shown on the lower graphs. During this period there were three seismicity peaks; these are shown in the lower part of Figure as 1, 2 and 3. There is a suggestion that the three seismicity peaks are related to the preceding rapid rises. This suggests an increase in seismicity occurring 15 - 20 days after the rapid rises.

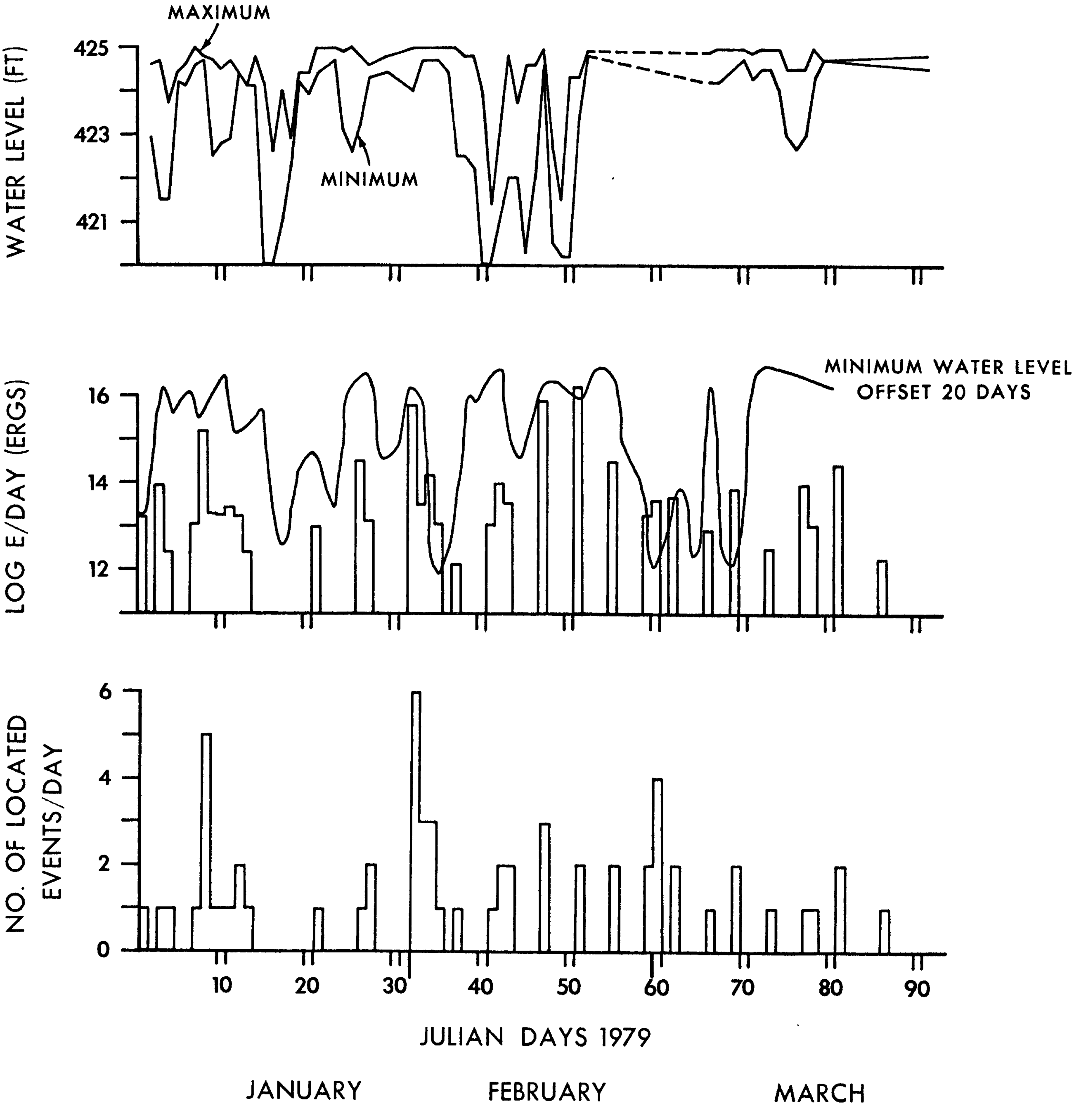
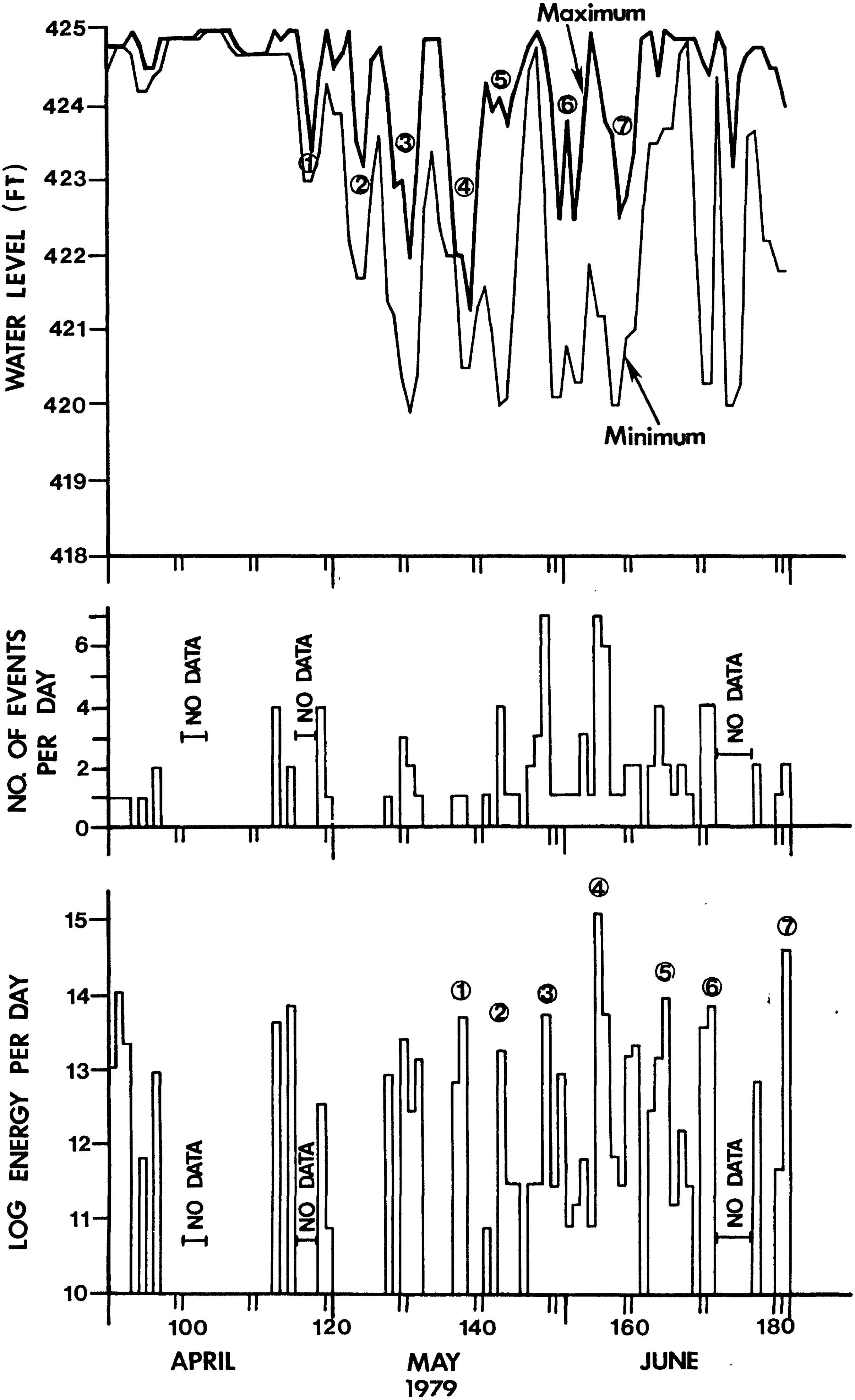
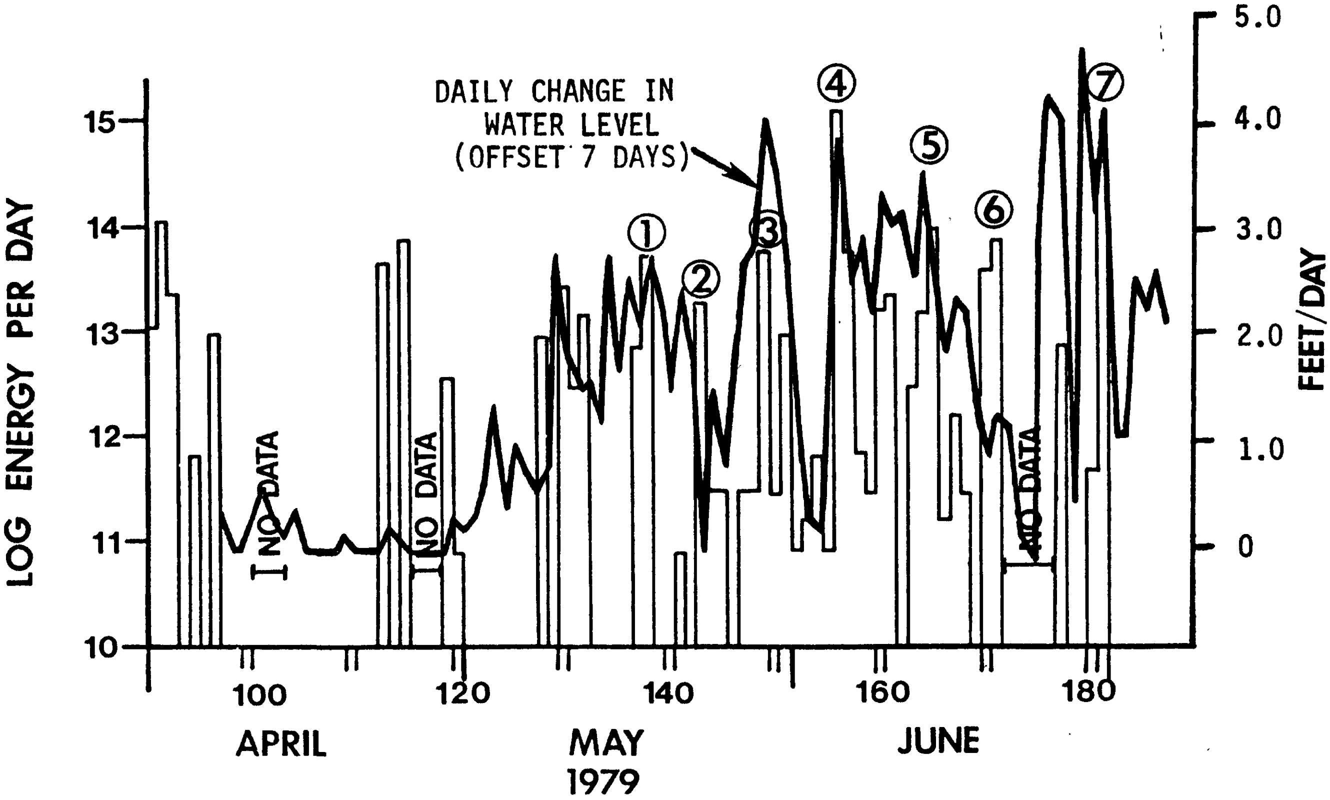

MAXIMUM
MINIMUM
WATER LEVEL (FT)
425
423
421
MINIMUM WATER LEVEL
OFFSET 20 DAYS
LOG E/DAY (ERGS)
16
14
12
NO. OF LOCATED
EVENTS/DAY
6
4
2
0
10
20
30
40
50
60
70
80
90
JULIAN DAYS 1979
JANUARY
FEBRUARY
MARCH

Figure 27



Maximum
Minimum
WATER LEVEL (FT)
425
424
423
422
421
420
419
418
①
②
③
④
⑤
⑥
⑦
NO. OF EVENTS PER DAY
6
4
2
0
NO DATA
NO DATA
NO DATA
LOG ENERGY PER DAY
15
14
13
12
11
10
NO DATA
NO DATA
NO DATA
①
②
③
④
⑤
⑥
⑦
100
120
140
160
180
APRIL
MAY
JUNE
1979



LOG ENERGY PER DAY
15
14
13
12
11
10
DAILY CHANGE IN
WATER LEVEL
(OFFSET 7 DAYS)
NO DATA
NO DATA
NO DATA
1
2
3
4
5
6
7
5.0
4.0
3.0
2.0
1.0
0
FEET/DAY
100
120
140
160
180
APRIL
MAY
1979
JUNE

Figure 29

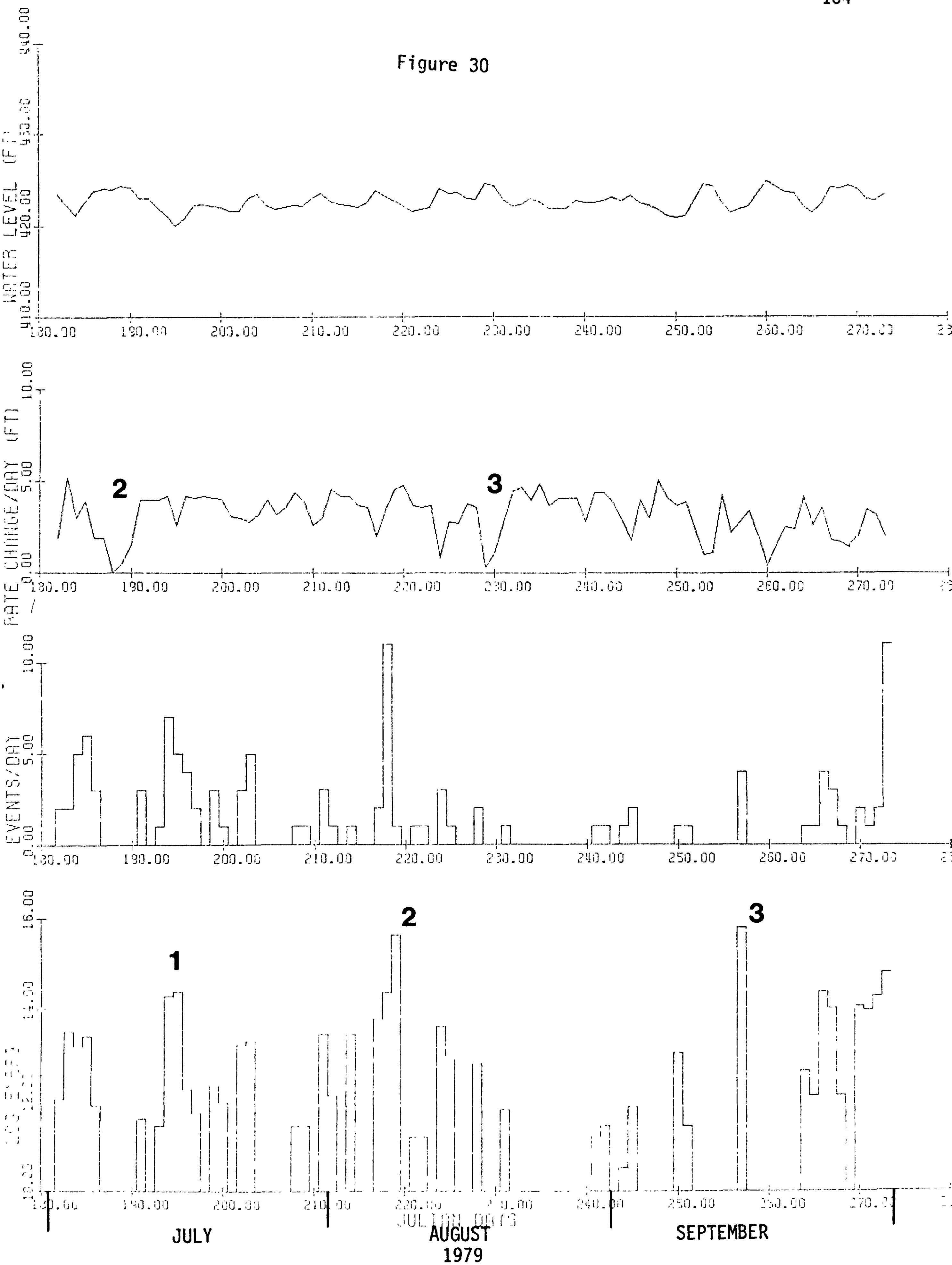

WATER LEVEL (FT)
RATE CHANGE/DAY (FT)
EVENTS/DAY
2
3
1
2
3
JULIAN DAYS
JULY
AUGUST
SEPTEMBER
1979

Figure 30

V. ANALYSIS OF MONTICELLO EARTHQUAKES RECORDED ON ANALOG TAPES

After the installation at the end of May 1978 of the additional 6 USGS seismograph (Figure 18), meaningful data were obtained only at the end of July 1978. These data, obtained from stations 5 - 10 were telemetered and recorded at Parr, near station 5. In August 1978, data from the four SCE&G stations were also telemetered in to Parr. All these data were recorded on analog magnetic tapes. To obtain seismograms we had to use USGS playback facilities at Las Vegas. However the personnel there were under transfer orders and hence there was considerable delay in a new playback facility being set up at Golden. These delays, together with a low priority alloted to the Monticello project caused embarrassingly large delays. Consequently in this report, we present an analysis of the data recorded between July 27 to the end of December 1978.

V.1. *Results*

In the period July - December 1978, 180 events were recorded on analog tapes. In analysing, data recorded on portable seismographs were also used. (This was primarily for the earlier periods--July - August--See Figure 19). These data consisted of 173 natural events and 7 quarry blasts (Appendix VIII). Of these 173 events, 170 (or 98%) were shallower than 2 km (68% with a depth $\leq$ 1 km), 155 (or 90%) were of quality A and B, and 160 (or 92%) had solutions with RMS errors of less than 0.1 sec. These data are presented in Table 8, the events not used in analysis are indicated by astericks. Those events with a hypocentral solution having qualities A and B, and an RMS value of < 0.1 sec, ERH, ERZ < 1 km are plotted in Figure 31. These events are divided into 5 clusters for further analysis.

TABLE 8

STATISTICS OF EVENTS RECORDED ON ANALOG TAPES

CLUSTER	TOTAL NO. OF EVENTS	Z (km)	NO.	Q				RMS (SEC)		NO. OF EVENTS REJECTED	REMARKS
				A	B	C	D	<0.1	≥0.1		
I	11	0-1	7	1	6			7			
		1-2	4	1	3			4			Not used for FPS
II	45	0-1	40	22	16	2*		40		2	3 FPS
		1-2	5	3	2			2	3*	3	Not used for FPS
III	29	0-1	23	12	11			23			2 FPS
		1-2	4	3	1*			3	1*	1	Not used for FPS
		2-3	2		2			2			Not used for FPS
IV	80	0-1	43	7	28	7*	1*	41	2*	10	2 FPS
		1-1.5	18	3	12	3*		17	1*	4	
		1.5-2	18	2	13	3*		18		3	1 FPS
		3-4	1				1*		1*	1	
V	8	0-1	5		5			2	3		
		1-2	3		2	1		1	2*		
TOTAL	173	0-1	118	42	66	9*	1*	113	5		
		1-2	52	12	33	7		45	7*		
		2-3	2		2			2			
		3-4	1				1*		1*	1	

TABLE 8 (Continued)

TOTAL	Z(km)	0-1	1-2	0-2	>2
173	No.	118	52	170	3
	%	68	30	98	2

TOTAL	Q	A	B	C	D	A and B
173	No.	54	101	16	2	155
	%	31	58	9	1	90

TOTAL	RMS (Sec)	<0.1	$\geq$0.1
173	No.	160	13
	%	92	8

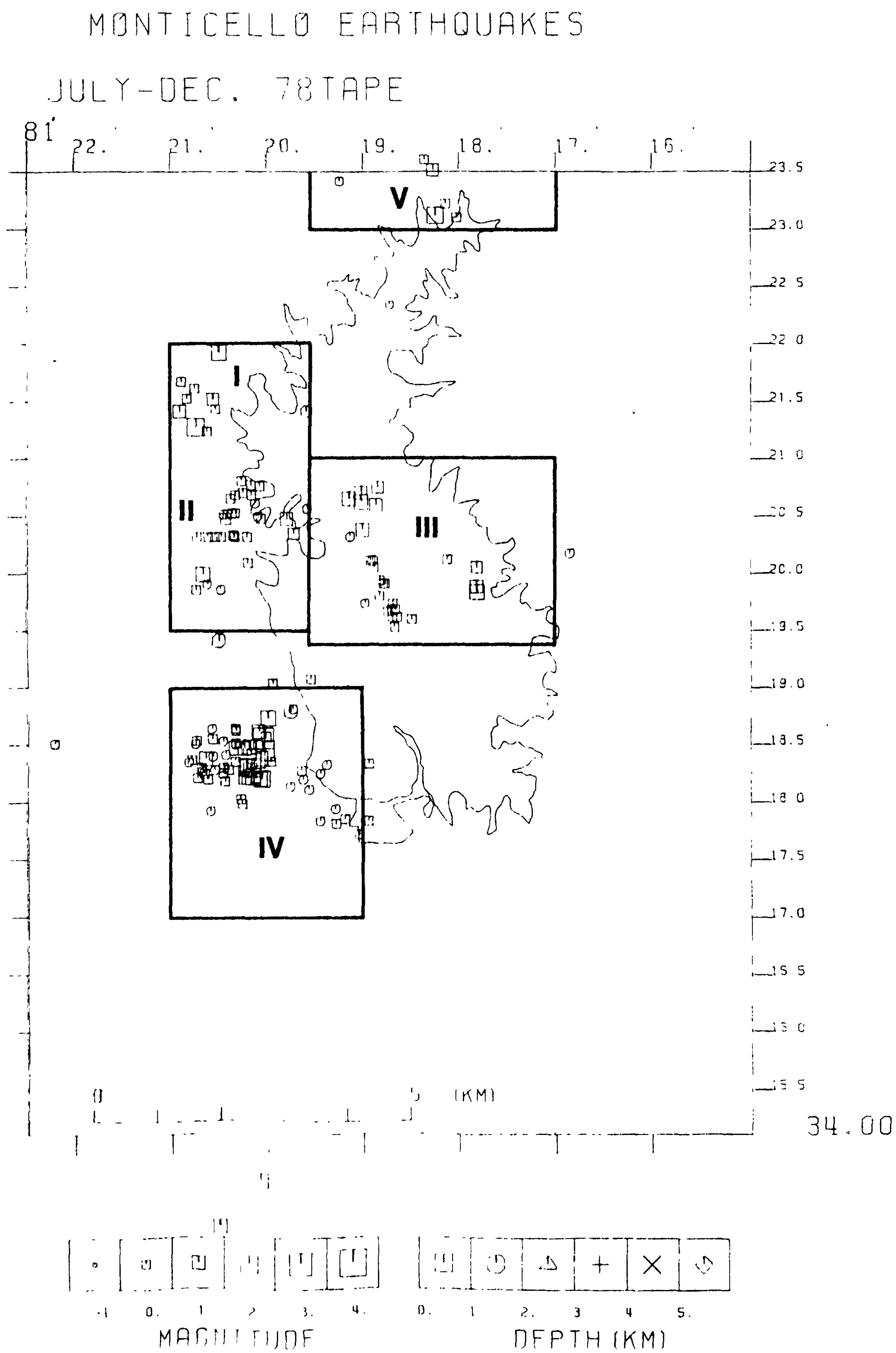

MONTICELLO EARTHQUAKES
JULY-DEC. 78TAPE
81
22.
21.
20.
19.
18.
17.
16.
V
I
II
III
IV
23.5
23.0
22.5
22.0
21.5
21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
(KM)
34.00
-1
0.
1
2
3.
4.
MAGNITUDE
0.
1
2.
3
4
5.
DEPTH (KM)

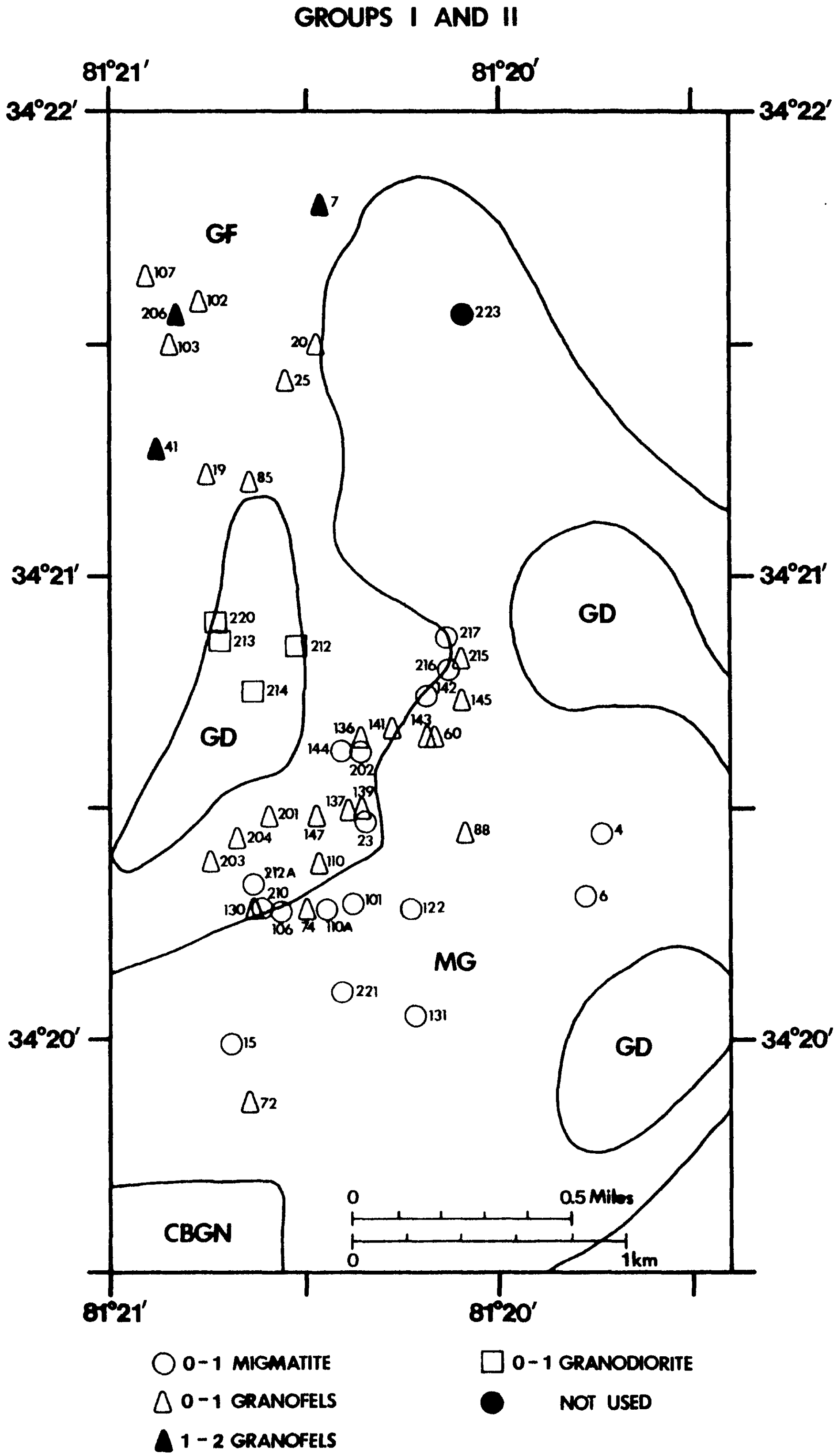
Figure 31

These clusters are based on the spatial locations, and we note that most of the activity lies in Clusters I - IV. These data are analysed in some detail. The geology is incorporated from that reported in the Final Safety Analysis Report (1977). (The geology of the area has been described in detail in the 7th report (Talwani, 1978) and will not be repeated here.) However it is pertinent to mention, that the local geology is characterised by the granodiorite rocks which have intruded the country rocks (Charlotte belt gneiss,(CBGN)and granofels). The aureole around the intrusive rocks is a mixture of both rock types, generally more fractured and altered. This unit has been mapped as migmatite, and appears to be the location of the earliest seismicity following the impoundment.

V.1.1 *Clusters I and II*

Figure 32 is an enlarged view of the events in Clusters I and II (Figure 31). The events have been located on the geological map. Events located on the NW corner of Figure 32 constitute Cluster I, whereas the remaining constitute Cluster II. Most of these events lie on granofels, and the shallower events, 0 - 1 km, (open triangles) were used to obtain a composite fault plane solution (Figure 33). We obtain a thrust fault mechanism with a sizable strike slip component. (The results of the fault plane solutions are presented in Table 9).

For Cluster (or group) II, 40 out of the 45 events have depths $\leq$ 1.0 km. They are located on the granofel, granodiorite and on the migmatite units (Figure 32). When making the fault plane solutions, events located on one unit were found to support the fault plane solution on another unit. Consequently the symbols used in Figure 32 represent the fault plane solutions that particular event was used in. These loosely reflect the



GROUPS I AND II
81°21′
81°20′
34°22′
34°22′
34°21′
34°21′
34°20′
34°20′
GF
GD
GD
GD
MG
CBGN
7
107
102
206
103
20
25
223
41
19
85
220
213
212
214
217
215
216
142
145
136
141
143
60
144
202
139
137
201
147
23
204
88
4
203
110
212A
210
130
106
74
110A
101
122
6
221
131
15
72
0
0.5 Miles
0
1km
81°21′
81°20′
0-1 MIGMATITE
0-1 GRANOFELS
1-2 GRANOFELS
0-1 GRANODIORITE
NOT USED

Figure 32

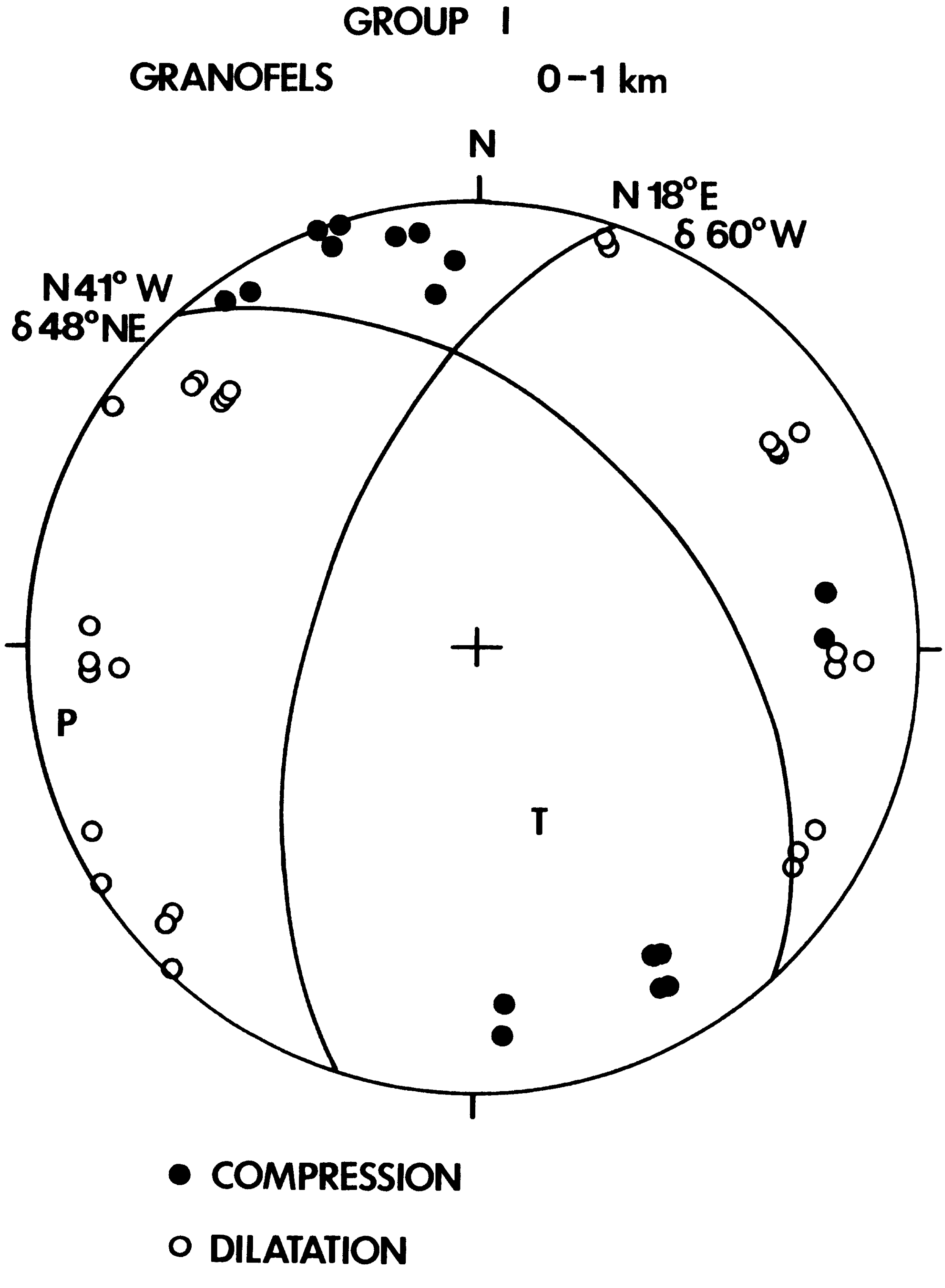

GROUP I
GRANOFELS
0-1 km
N
N 18°E
δ 60°W
N41° W
δ 48°NE
P
T
● COMPRESSION
○ DILATATION

Figure 33

geologic unit they are located on. The event numbers correlate with those given in Appendix VIII.

The events lying on granofels (open triangles) have a thrust fault mechanism (Figure 34, and Solution 1, in Cluster II, Tables 9 and 10). The events lying on granodiorite occurred in December 1978 (open squares) are few to have a constrained solution. However these too support a thrust mechanism with a large strike slip component (Figure 35, and Solution 2, Cluster II, Tables 9 and 10). The events lying on migmatite unit (open circles) have a well constrained thrust fault mechanism (Figure 36). However unlike the previous solutions, the nodal planes strike to the NW (Solution 3, Cluster II, Tables 9 and 10). The implications of these orientations are discussed later.

V.1.2 *Cluster III*

Figure 37 is an enlarged view of the events in Cluster III as defined in Figure 31. Only the 23 shallow (0 - 1 km) events of the total of 29 in this group were used in the analysis. The deeper events (completely shaded in Figure 37) were not used. Two events #47 and 211 (small dots) were also not used. Most of the events in this cluster lie in the migmatite unit (circles) and their composite fault plane solution (Figure 38, Solution 1, Cluster III in Tables 9 and 10) supports thrust faulting in a NW direction. Four events located on CBGN and GF were used to obtain another composite fault plane solution (Group III, Solution 2, Table 9). The data are not well constrained (Figure 39).

We choose the one shown by solid lines in Figure 39. This is a thrust fault solution, with northerly striking nodal planes and a large strike slip component (Table 10).

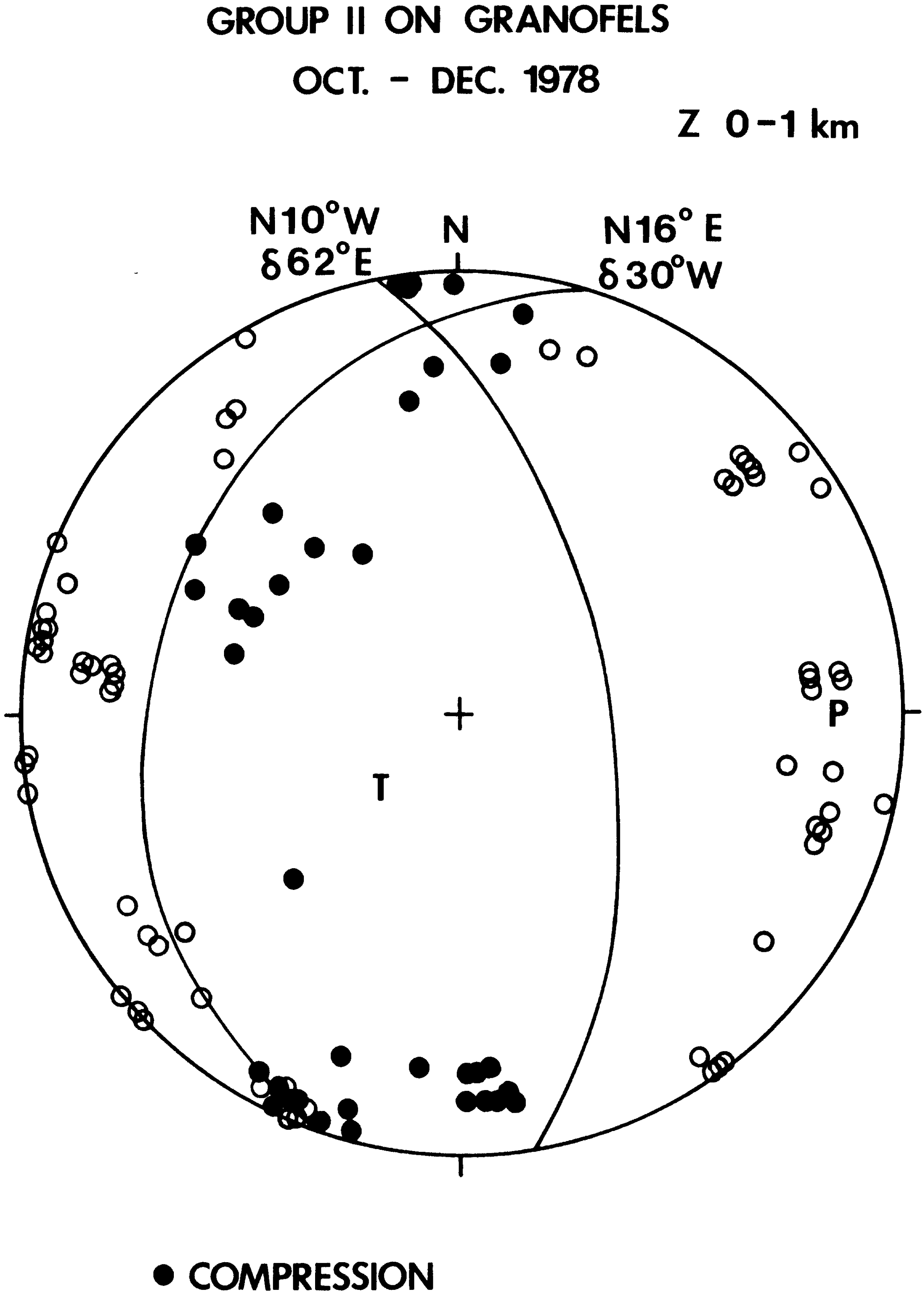

GROUP II ON GRANOFELS
OCT. - DEC. 1978
Z 0-1 km
N10°W
δ62°E
N
N16° E
δ30°W
T
P
● COMPRESSION
○ DILATATION

Figure 34

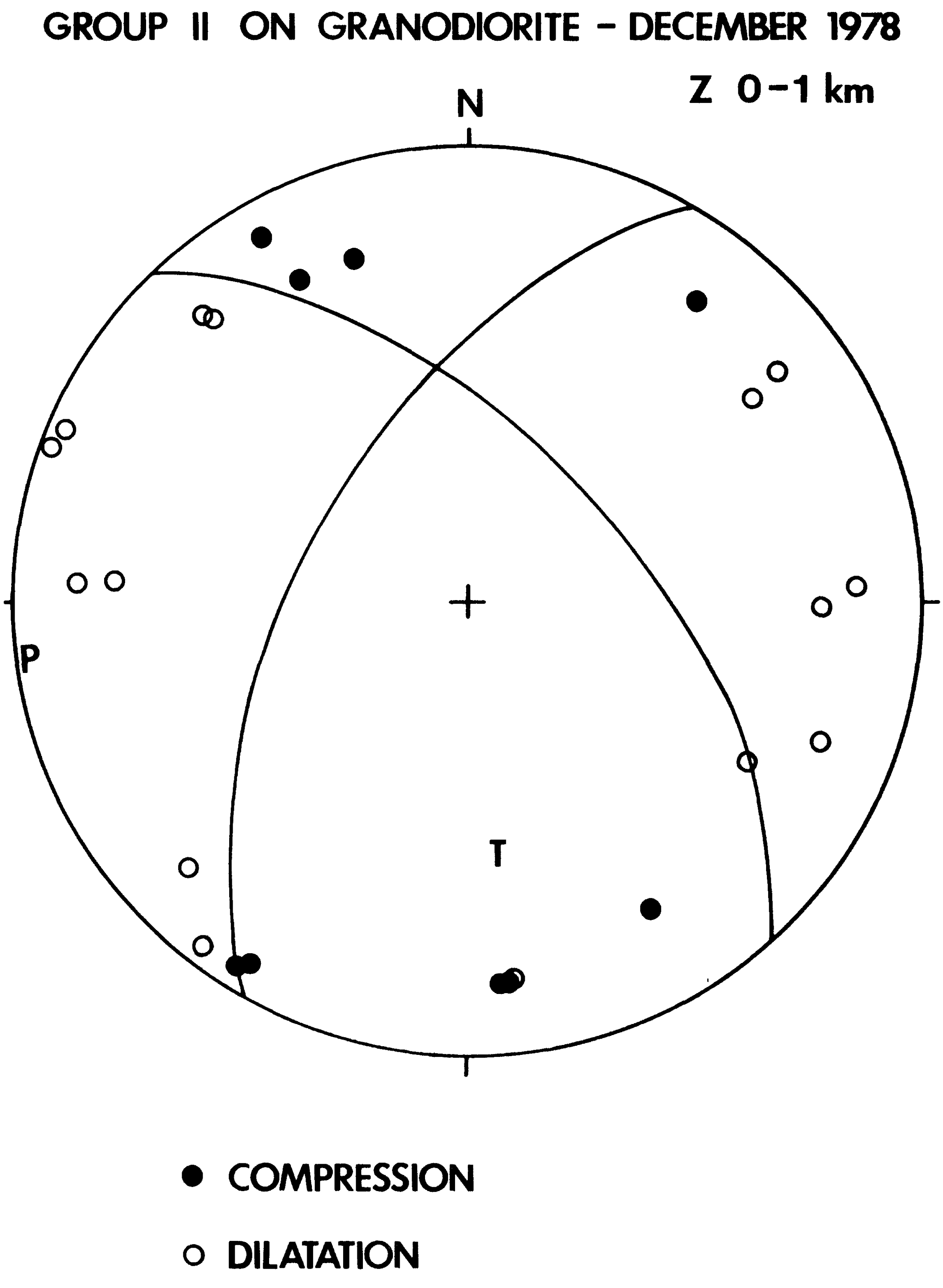

GROUP II ON GRANODIORITE - DECEMBER 1978
Z 0-1 km
N
P
T
COMPRESSION
DILATATION

Figure 35

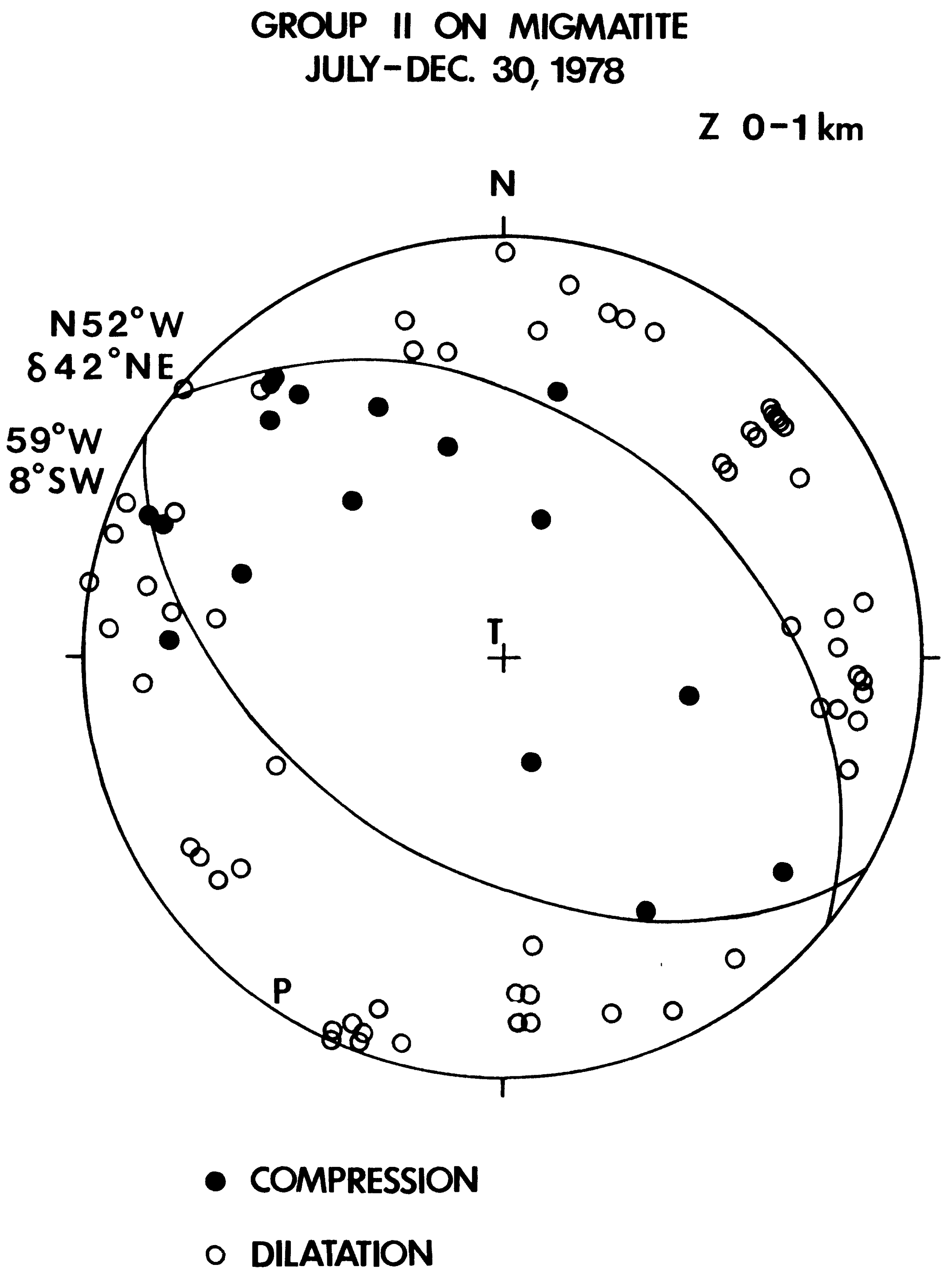

GROUP II ON MIGMATITE
JULY-DEC. 30, 1978
Z 0-1 km
N
N52°W
δ42°NE
59°W
8°SW
T
P
COMPRESSION
DILATATION

Figure 36

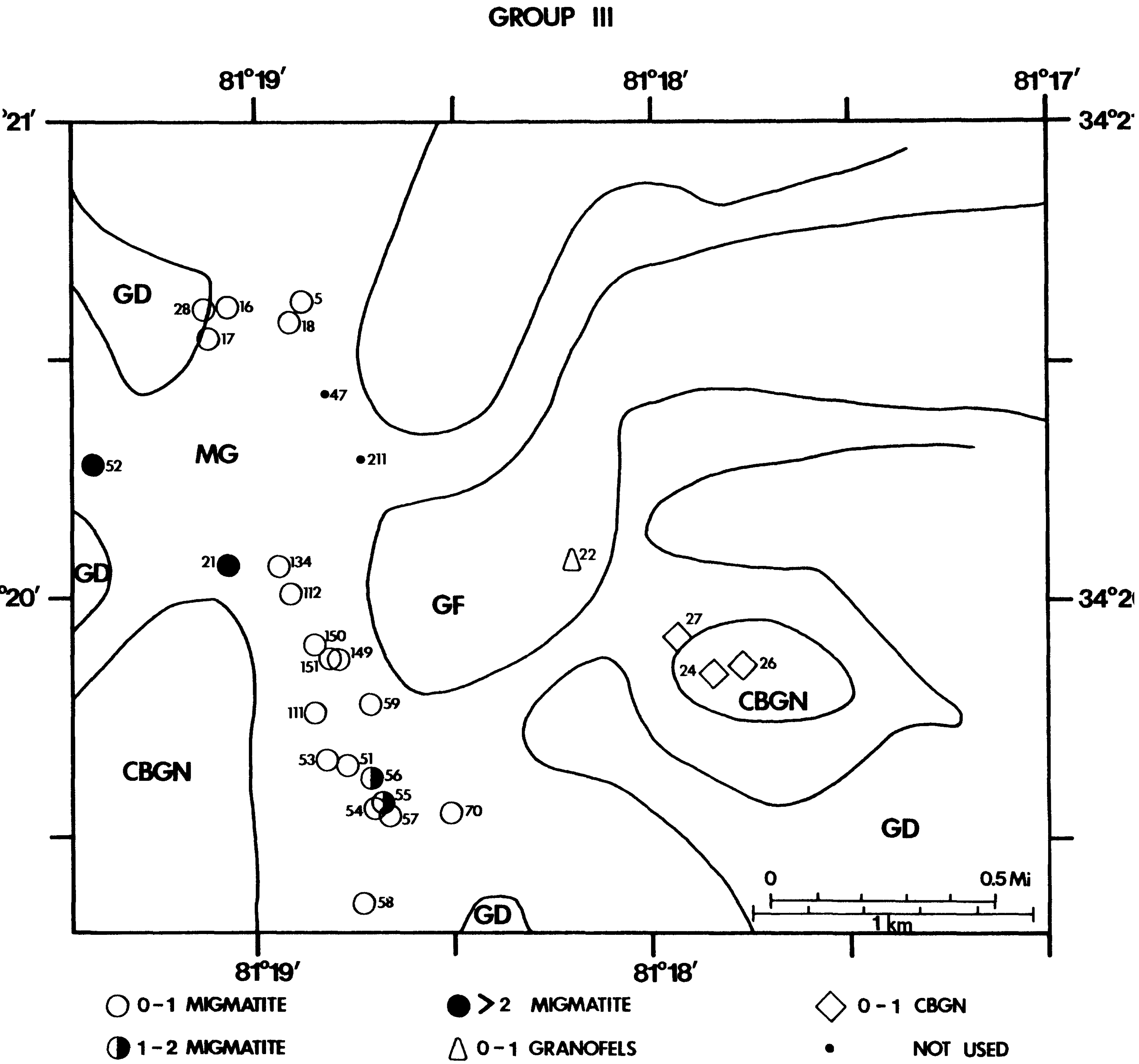

GROUP III
81°19′
81°18′
81°17′
°21′
34°2
°20′
34°2
GD
MG
GD
GF
CBGN
CBGN
GD
GD
28
16
5
18
17
47
52
211
22
21
134
112
27
150
149
151
24
26
59
111
53
51
56
55
54
57
70
58
0
0.5 Mi
1 km
81°19′
81°18′
0 – 1 MIGMATITE
> 2 MIGMATITE
0 – 1 CBGN
1 – 2 MIGMATITE
0 – 1 GRANOFELS
NOT USED

Figure 37

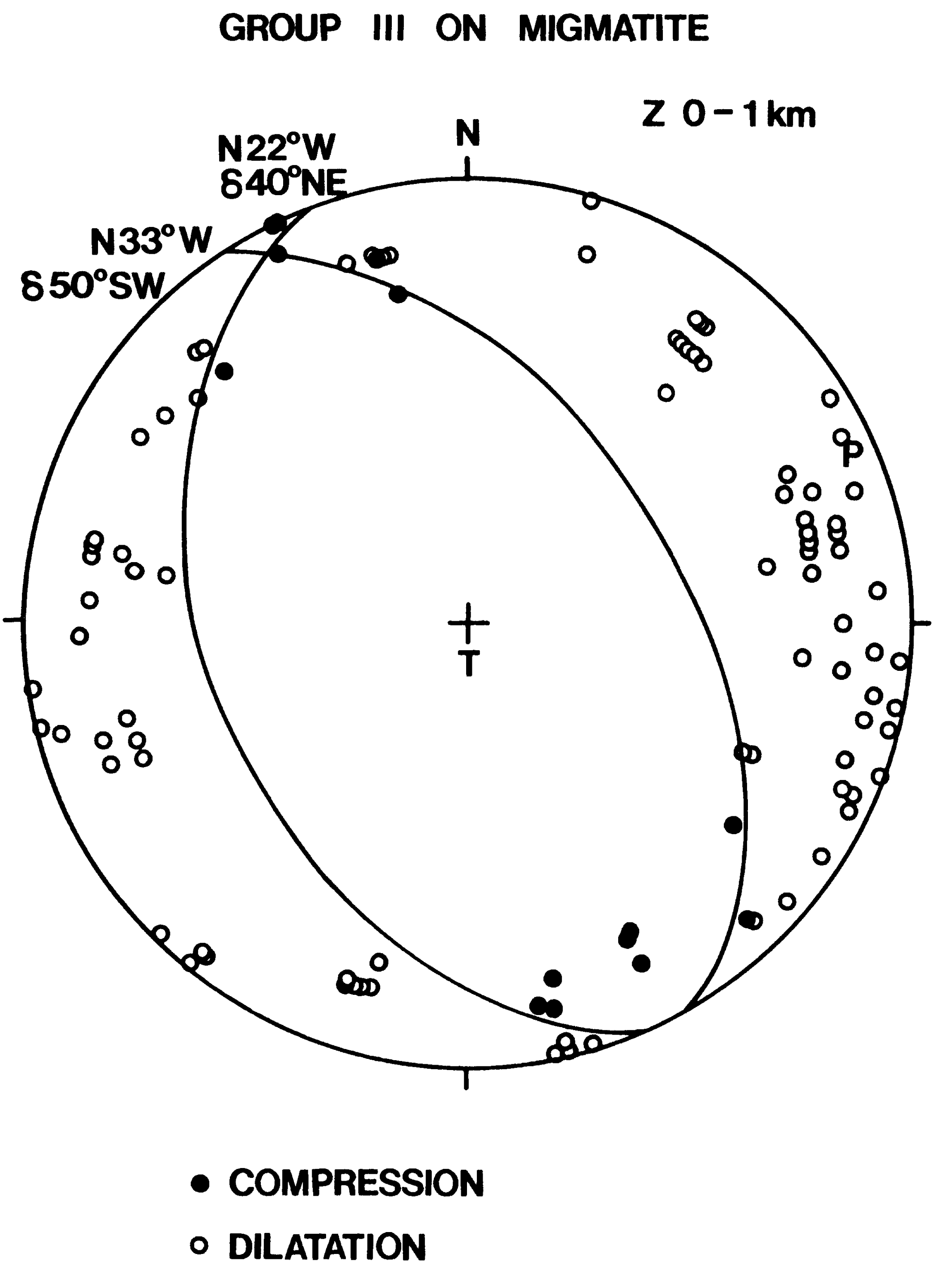

GROUP III ON MIGMATITE
Z 0-1km
N
N22°W
δ40°NE
N33°W
δ50°SW
P
T
● COMPRESSION
○ DILATATION

Figure 38

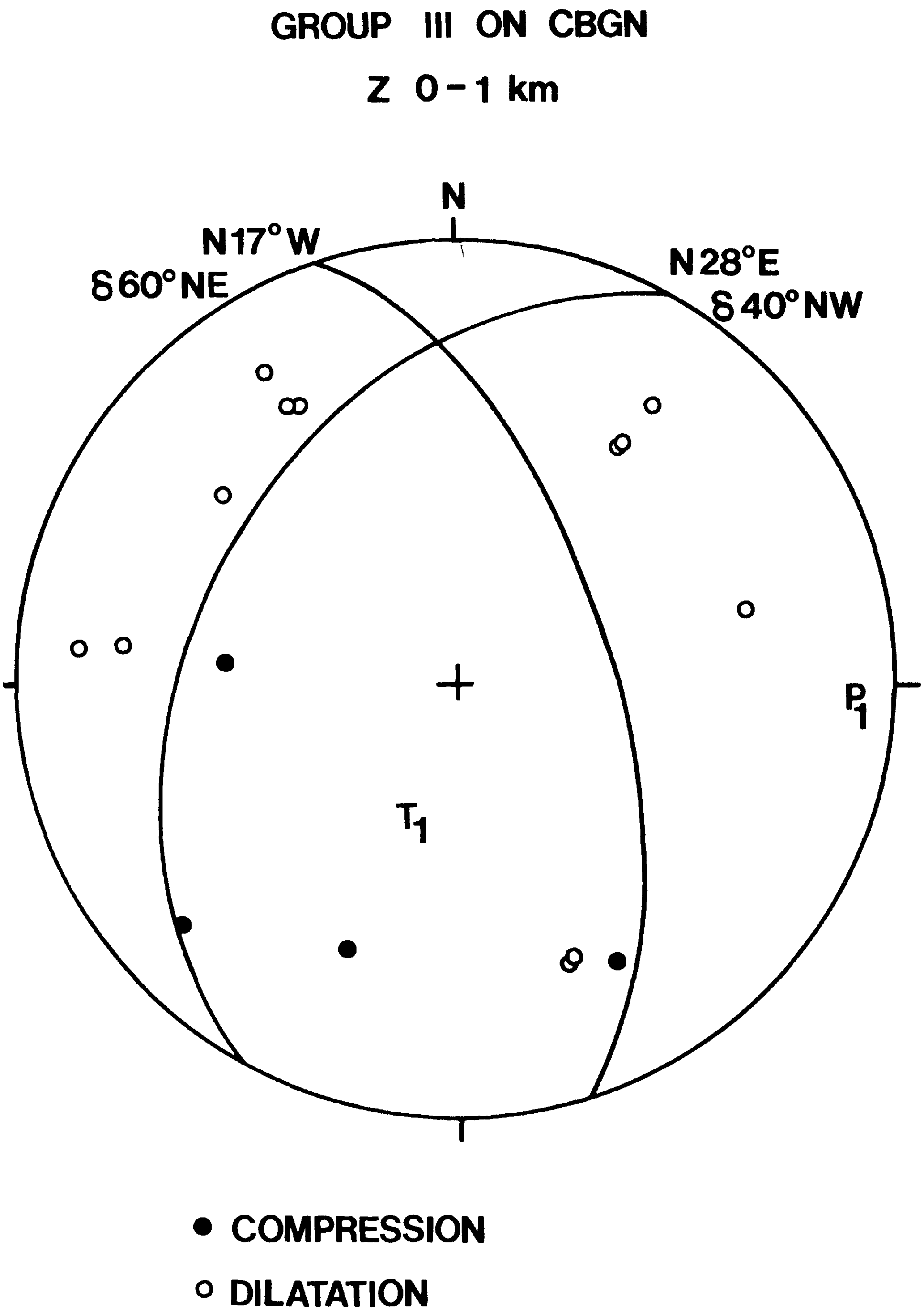

GROUP III ON CBGN
Z 0-1 km
N
N17°W
δ60°NE
N28°E
δ40°NW
P1
T1
● COMPRESSION
○ DILATATION

Figure 39

V.1.3 *Cluster IV*

This cluster contains nearly half of all the events used. It was possible to obtain two fault plane solutions for events with depths 0 - 1 km and one each for events in the depth range 1.0 - 1.5 km and 1.5 - 2.0 km. On discussion with the geologists responsible for the mapping of the various units it was found that the mapped contacts of the migmatite unit in Cluster IV were tentative. Consequently the events were divided according to their depths and according to the fault plane solutions they fit. NW and NS in the index (Figure 40) indicate the orientation of the nodal planes of the resulting fault plane solutions.

Figure 41 (Cluster IV, Solution 1) showing thrust faulting was obtained by using the events shown by open triangles in Figure 40. As can be seen in Figure 40, most of the triangles lie along a NS line--the orientation of the fault planes (Table 9).

Figure 42 (Cluster IV, Solution 3) is the composite fault plane solution of shallow events (open circles in Figure 40) and indicates thrust faulting on planes striking to the NW (Table 9).

Figures 43 and 44 (Cluster IV, Solutions 3 and 4 respectively) are composite fault plane solutions for events with depths 1 - 1.5 km and 1.5 - 2.0 km respectively. They both indicate thrust faulting, but with large strike slip components (Table 10).

We have very few events in Group V (Table 8, Figure 31). These were used to obtain a NW trending thrust fault composite fault plane solution (Figure 45, Table 9).

V.2. *Discussion*

The seismograms obtained from the playbacks of the events ~~recorded~~ on magnetic analog tapes were stretched in time, so that it was possible

GROUP IV

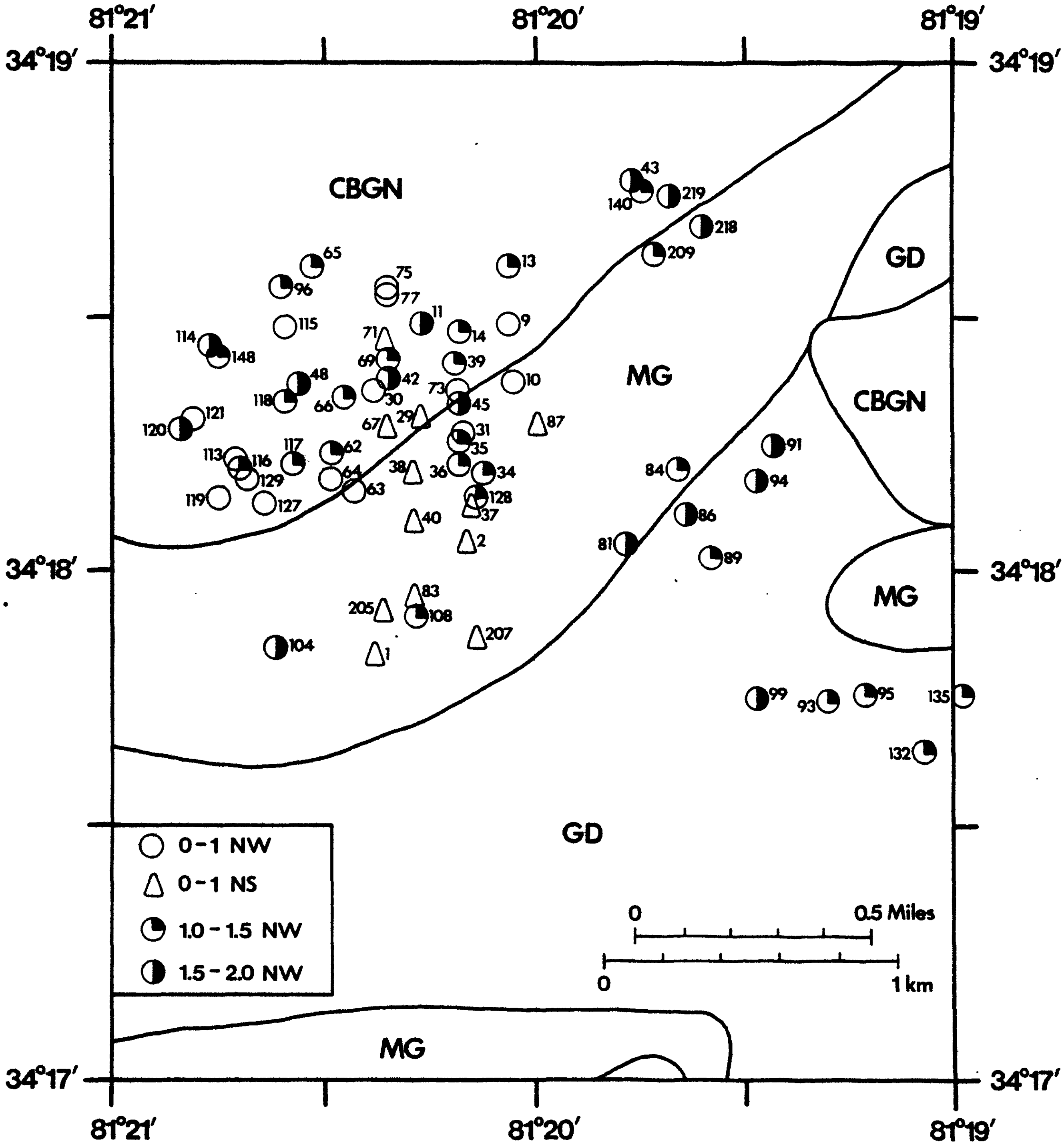
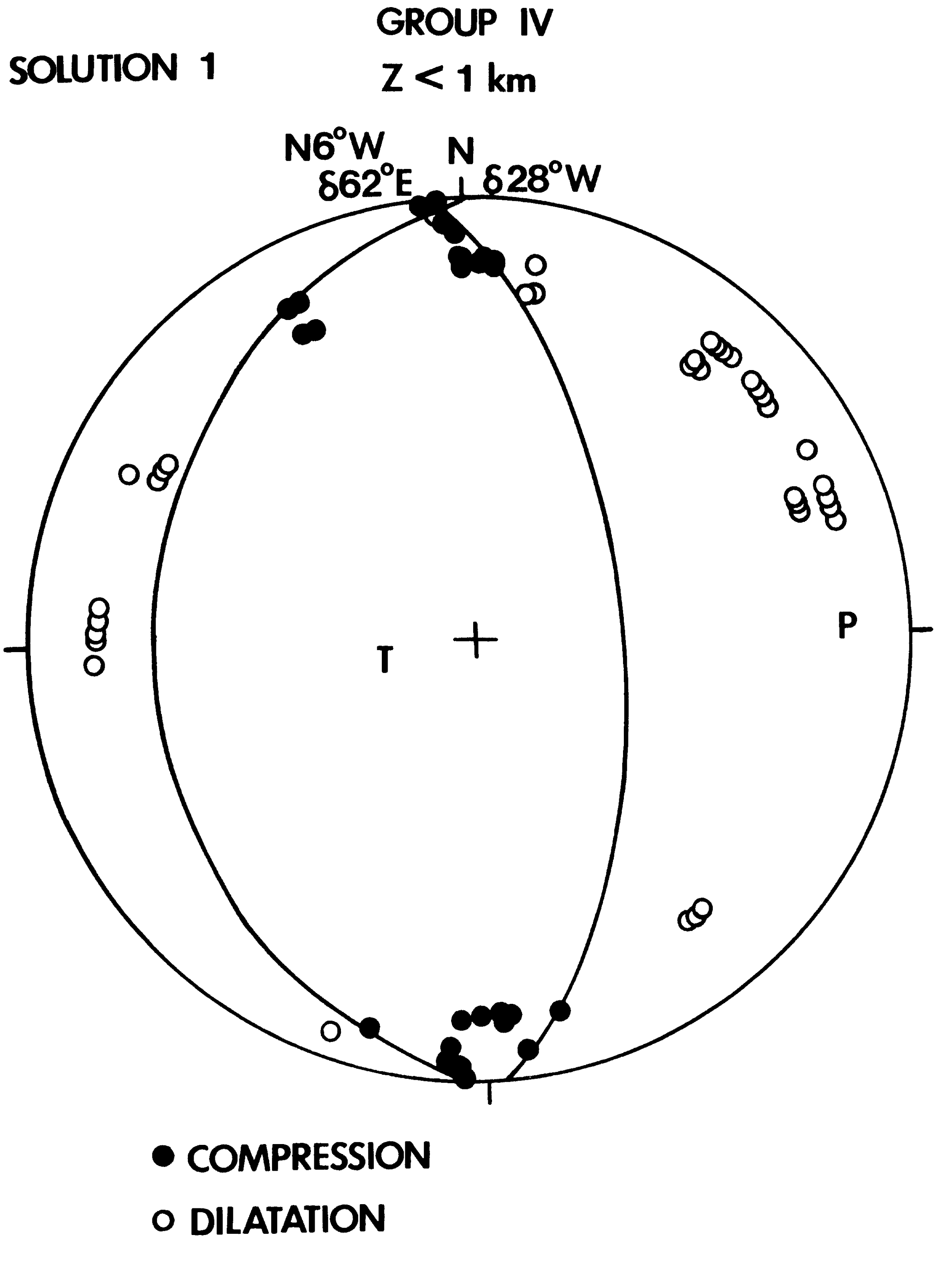


Figure 40



GROUP IV
SOLUTION 1
Z < 1 km
N6°W
δ62°E
N
δ28°W
T
P
● COMPRESSION
○ DILATATION

Figure 41

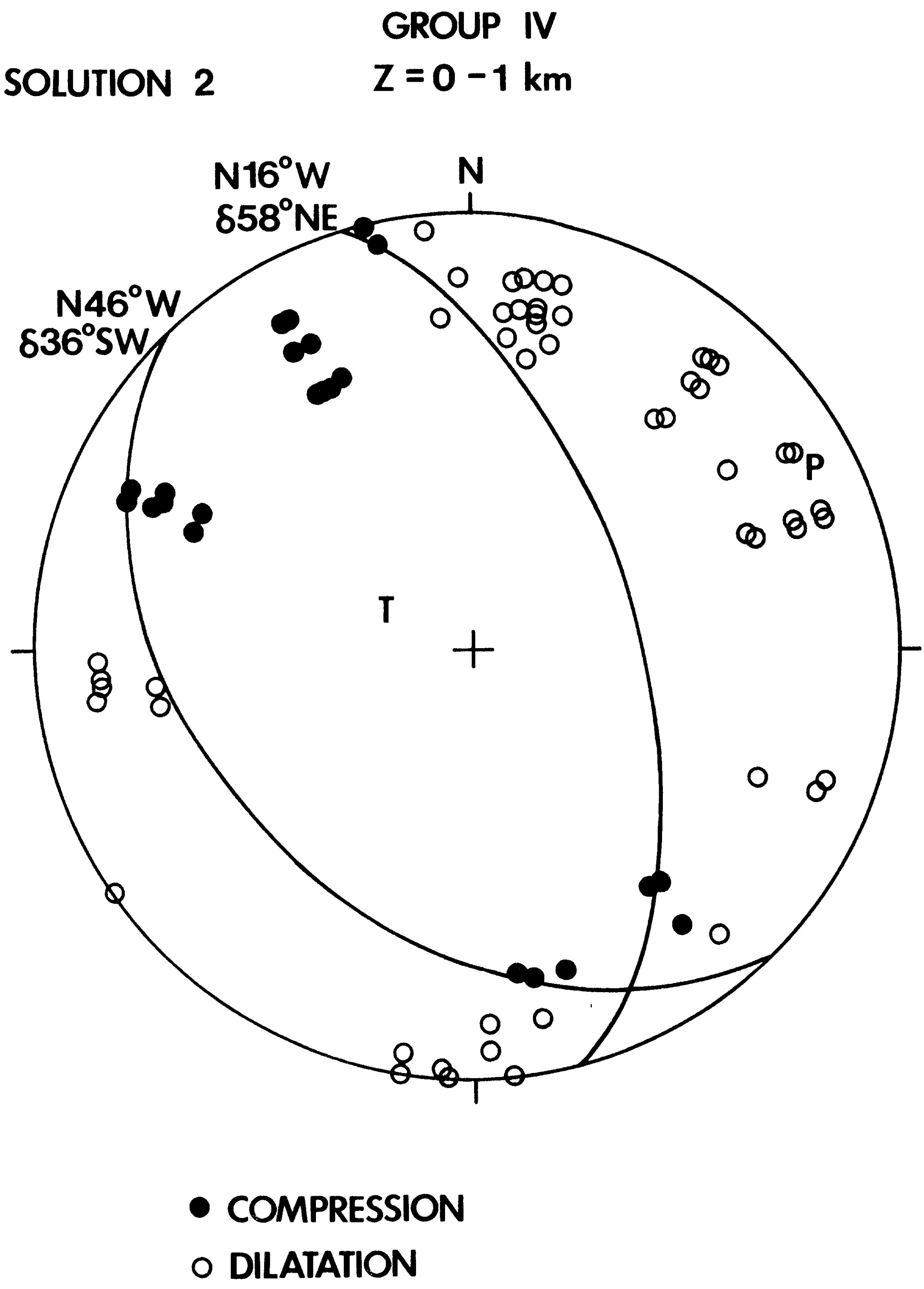

GROUP IV
SOLUTION 2
Z = 0 -1 km
N
N16°W
δ58°NE
N46°W
δ36°SW
P
T
● COMPRESSION
○ DILATATION

Figure 42

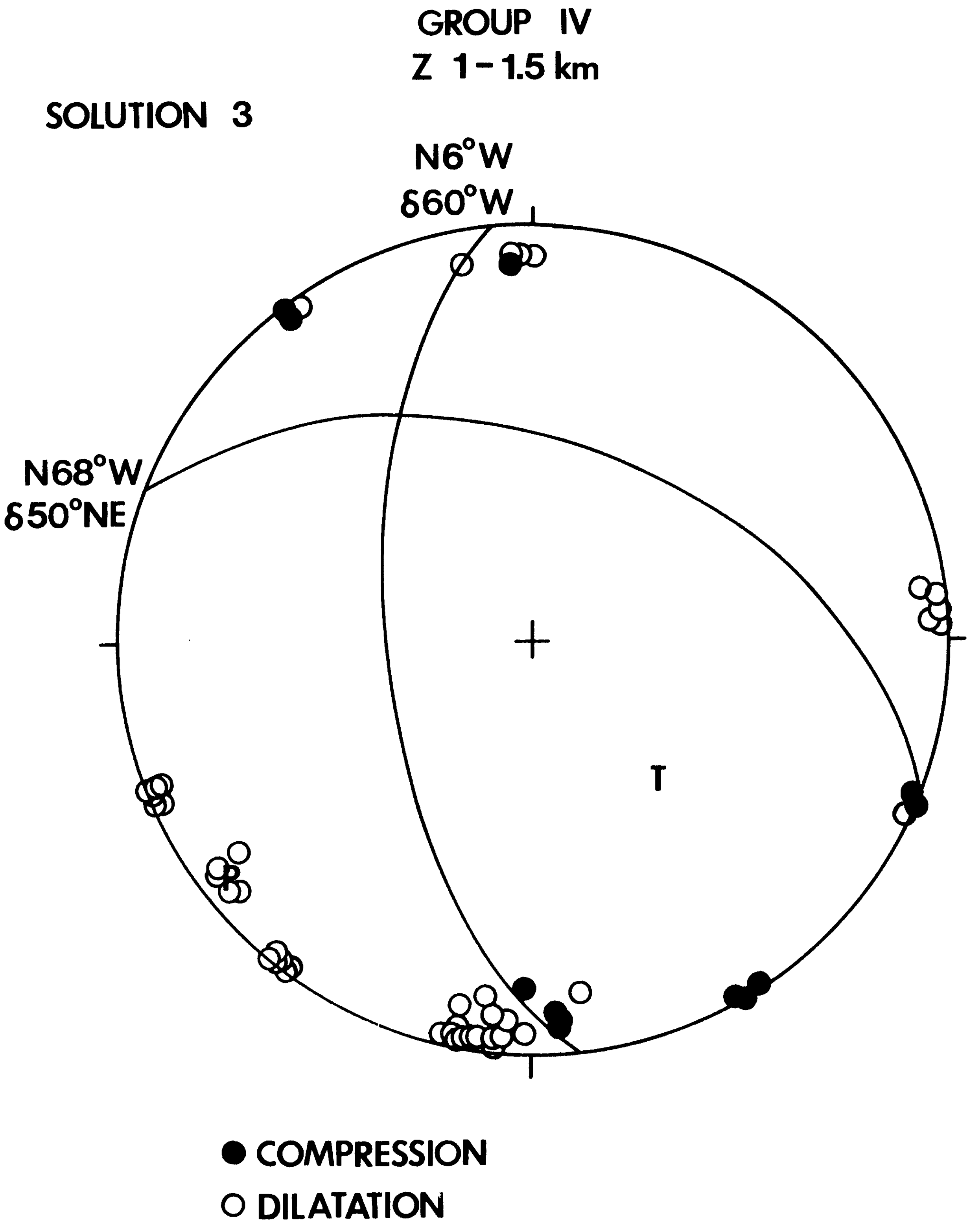

GROUP IV
Z 1-1.5 km
SOLUTION 3
N6°W
δ60°W
N68°W
δ50°NE
T
P
COMPRESSION
DILATATION

Figure 43

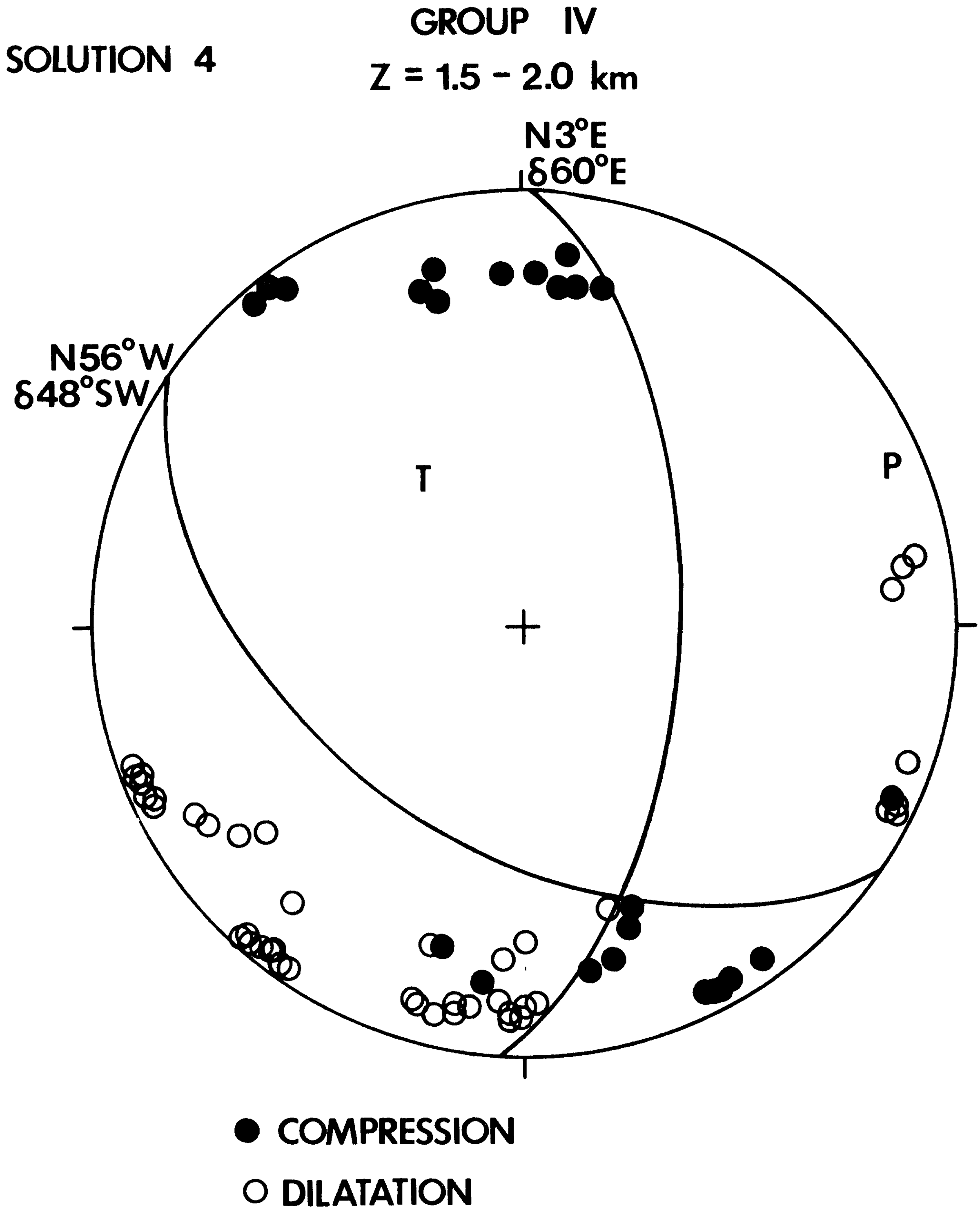

SOLUTION 4
GROUP IV
Z = 1.5 - 2.0 km
N3°E
δ60°E
N56°W
δ48°SW
T
P
COMPRESSION
DILATATION

Figure 44

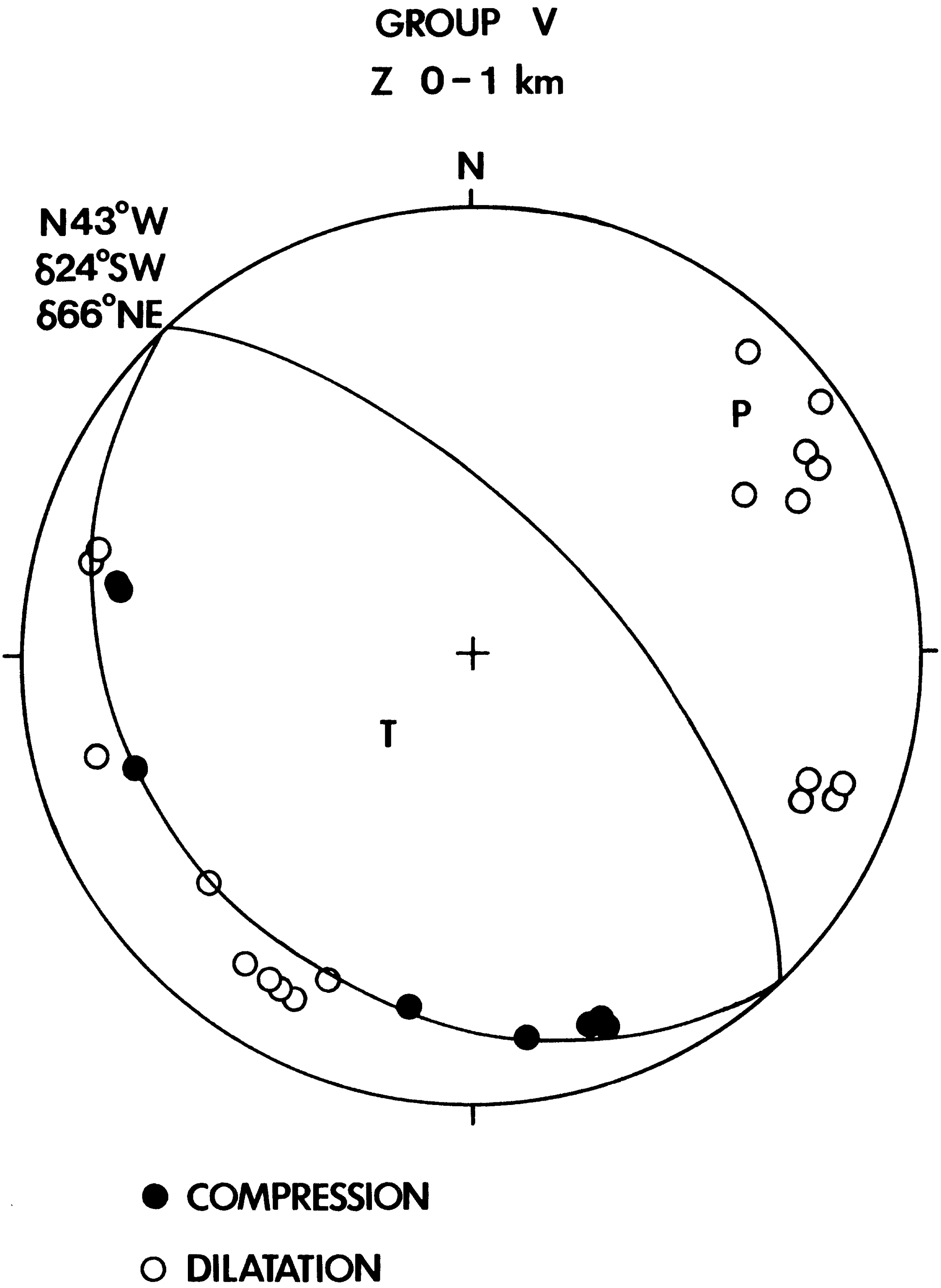


Figure 45

to read the times correctly to 0.01 sec. The availability of an accurate velocity model made it possible to locate events recorded on the magnetic tapes correctly to a few hundred meters. (The velocity model was obtained by using the sonic logs to 1 km depth in USGS well #1 and data from 2 calibration shots. The shots could be located to within 100 m of their site by using the resultant velocity model). Thus the hypocentral locations obtained from an analysis of the magnetic tape data are considered to be reliable and used in the analysis of induced seismicity at Monticello reservoir.

V.2.1. *Depths*

Unlike the depths obtained by the analysis of data from SCE&G network, we note (Table 8) that 98% of the events are shallower than 2 km. The event numbers in Figures 32, 37 and 40 are chronological. However they are not uniformly distributed in time. In this time frame (July - December 1978), we do not see any obvious deepening of hypocenters with time.

V.2.2. *Temporal distribution of seismicity*

The event numbers represent the sequence of analysis. Event numbers 1 - 18 are for the period July and August 1978. They include the large (M_L 2.7) event on August 27, 1978. Data from portable seismographs were incorporated in this period. Events 19 - 50 are for the period September 7 to October 6, 1978. There is a gap in data between October 6 and 12, 1978 due to some malfunctions in the tape recorder. Events 51 - 151 are for the period October 12 - December 4, 1978. Tape playbacks for events between December 5 and December 31, 1978 were received much after the earlier set. These are events 201 - 223. (There are no event numbers 151 - 200).

V.2.3. *Spatial distribution of seismicity*

The seismicity has been divided into 5 distinct clusters (Figure 31) for further analysis. In Cluster I, there are very few events (Figure 32); however there is a suggestion that the seismicity observed in the earlier period(#7, 19, 20, 25, 41) is spreading away from the lake (#102, 103, 107) and deepening in December (#206, 223).

In Cluster II, the earliest activity was within the lake (#4, 6), and later (in a gross sense) spread westward. The most noticeable observation is that there was no activity on the granodiorite (#212, 213, 214, 220) before December 1978.

Cluster III (Figures 37 and 31) is located in the middle of the lake. The earliest activity in December 1977 - March 1978 occurred here. So in this period (July - December 1978), it was essentially a continuation of the activity. Most of the seismicity occurred in the migmatite unit. The epicenters trend $\sim$ N 20^{o} W almost the same orientation as that of the fault planes (Figure 38, Table 9, Cluster III, Solution 1).

In Figure 46, showing Cluster IV, the Monticello reservoir is located to the NE corner. There was almost a complete absence of seismicity here on initial impoundment. (It was to the NE and E of Cluster IV.) We note that the most of the seismicity occurred in several discrete bursts. Considering those on August 27 - 28; September 14 - 15 and October 16 - 17, we notice a migration away from the reservoir. Though there are a few events between 1 and 1.5 km a majority of the events are shallower (0 - 1 km, open symbols). In the next spurts of activity (October 25 - 29,

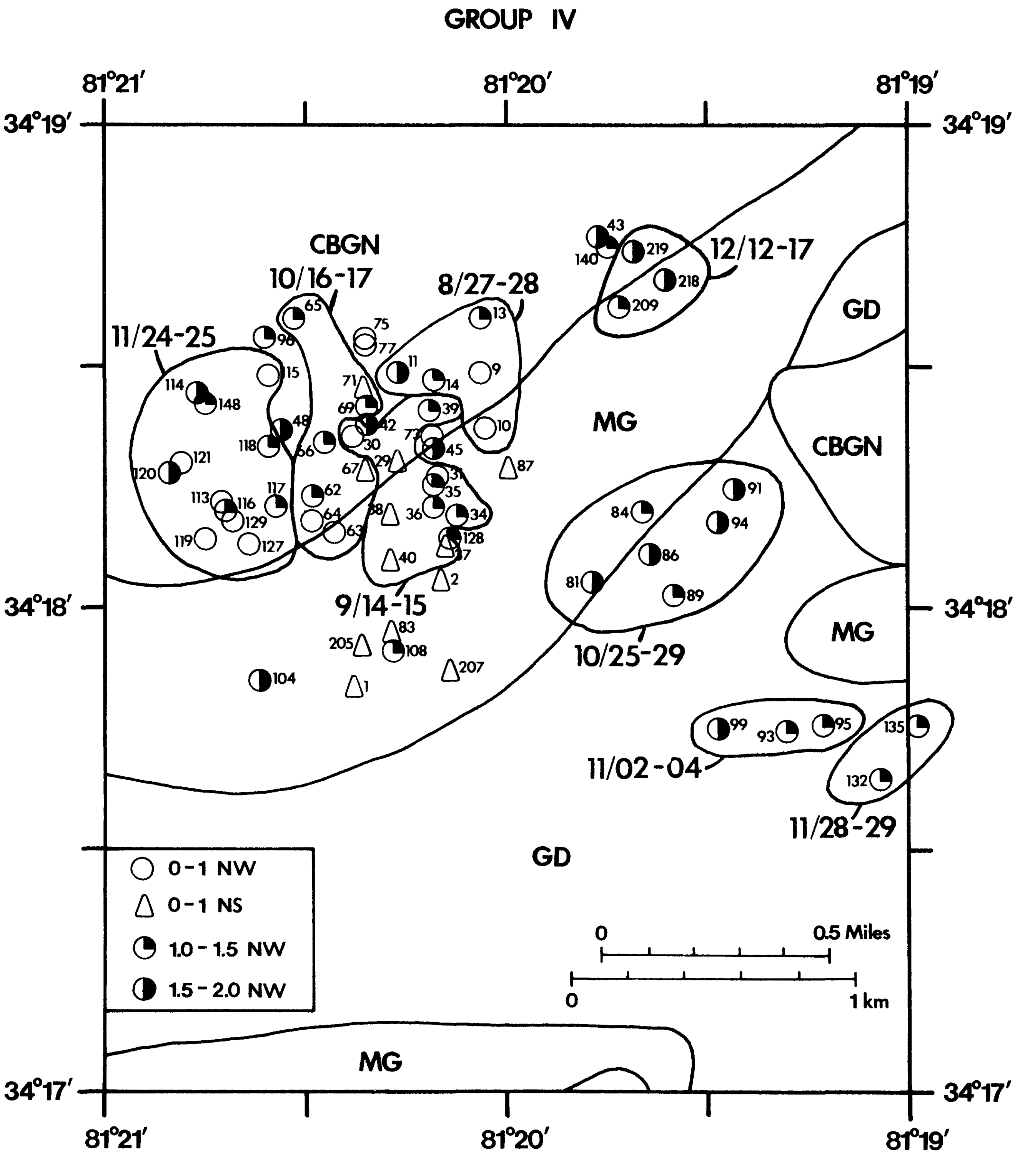

GROUP IV
81°21′
81°20′
81°19′
34°19′
34°18′
34°17′
CBGN
10/16-17
8/27-28
11/24-25
9/14-15
12/12-17
10/25-29
11/02-04
11/28-29
GD
MG
CBGN
MG
GD
MG
0-1 NW
0-1 NS
1.0-1.5 NW
1.5-2.0 NW
0
0.5 Miles
0
1 km

Figure 46

November 2 - 4) it migrated to the south, and further west and south (Nov. 24 - 25, and November 28 - 29). The activity to the south was deeper, whereas to the west there was no appreciable change. In December a few deeper events occurred closer to the lake (#209, 218, 219). This spreading out of seismicity, in discrete spurts, suggests that its cause may also be discrete perturbations of the stress field. One possible cause that is being studied is sudden changes in the reservoir levels.

The data for Cluster V are too few for detailed analysis but we hope to analyse other events located there, when we receive additional playbacks.

Thus a general conclusion one can draw from the spatial distribution of seismicity is that there seems to be some evidence of spreading of the activity, away from the lake. However because of the heterogeneity in the geological formations and (possibly) in the nature and degree of fractures in the rocks, the spreading is not smooth. We expect further detailed analysis to shed a light on this aspect.

V.2.4. *Analysis of the fault plane solutions*

Using the high quality data it was possible to divide the seismicity into five clusters. At least one composite fault plane solution was obtained for each cluster. These are summarized in Table 9. We have one solution each for Clusters I and V, two for Cluster III, three for Cluster II and four for Cluster IV. Except for solutions 3 and 4 for Cluster IV, all composite fault plane solutions are for events with depths ranging from 0 to 1 km. All fault plane solutions indicate that thrust faulting is the predominant mechanism. Some events, specially the deeper events (Cluster IV, Solutions 3 and 4) exhibit a sizable component of strike slip motion.

TABLE 9

GEOMETRIC DATA FOR CFPS OF EVENTS IN DIFFERENT CLUSTERS

CLUSTER DEPTH(KM)	ROCK TYPE	NO.	NODAL PLANE STRIKE	NODAL PLANE DIP	P AXIS AZIM.	P AXIS PLUNGE	T AXIS AZIM.	T AXIS PLUNGE
I	Granofels	1	N41°W	48°NE	260°	7°	160°	56°
0-1		2	N18°E	60°W				
II	Granofels	1	N10°W	62°E	90°	16°	231°	70°
0-1	Solution 1	2	N16°E	30°W				
	Granodiorite	1	N43°W	60°NE	263°	0°	172°	45°
	Solution 2	2	N28°E	60°NW				
	Migmatite	1	N52°W	42°NE	214°	4°	340°	85°
	Solution 3	2	N59°W	48°SW				
III	Migmatite	1	N22°W	40°NE	62°	6°	198°	83°
	Solution 1	2	N33°W	50°SW				
0-1								
	CBGN	1	N17°W	60°NE	92°	10°	201°	63°
	Solution 2	2	N28°E	40°NW				
IV	Mixed	1	N06°W	62°E	87°	17°	257°	73°
	Solution 1	2	N	28°W				
0-1								
	Mixed	1	N16°W	58°NE	62°	11°	294°	72°
	Solution 2	2	N46°W	36°SW				
1-1.5	Mixed	1	N68°W	50°NE	233°	7°	139°	54°
	Solution 3	2	N06°W	60°W				
1.5-2	Mixed	1	N03°E	60°E	66°	8°	325°	56°
	Solution 4	2	N56°W	48°SW				
V	Mixed	1	N43°W	66°NE	47°	21°	227°	69°
0-1	CBGN	2	N43°W	24°SW				

TABLE 10

SLIP VECTORS

CLUSTER	SOLUTION GEOLOGY	NODAL PLANE	AZIMUTH	DIP	STRIKE/THRUST COMP.
I	1	1	108^o	30^o	1.11
	Granofels	2	228^o	42^o	0.81
II	1	1	104^o	60^o	0.21
	Granofels	2	260^o	28^o	0.42
	2	1	118^o	30^o	1.43
	Granodiorite	2	227^o	30^o	1.43
	3	1	31^o	42^o	0.11
	Migmatite	2	217^o	48^o	0.09
III	1	1	237^o	40^o	0.14
	Migmatite	2	67^o	50^o	0.12
	2	1	119^o	50^o	0.53
	CBGN	2	253^o	30^o	0.81
IV	1	1	90^o	62^o	0.05
		2	264^o	28^o	0.11
	2	1	44^o	54^o	0.31
		2	254^o	32^o	0.47
	3	1	83^o	30^o	1.15
	(Deeper)	2	202^o	40^o	0.90
	4	1	34^o	42^o	0.81
	(Deeper)	2	272^o	30^o	1.07
V	1	1	47^o	66^o	0.00
		2	227^o	24^o	0.00

We note that there are two predominant orientations of the nodal planes, NS and NW - SE. The P axes, as would be expected for thrust faults are predominantly close to horizontal (Table 9). However their azimuth is not consistent. The slip vectors were obtained for both nodal planes for each of the fault plane solutions. These are summarized in Table 10. A perusal of Tables 9 and 10 indicated that the orientations of the P axes and of the slip vectors were related to the rock units the events were associated with. So they were separated on the basis of their geologic association (Table 11). The geology of Cluster IV is uncertain, and hence the rock unit has been labelled "mixed". In Group A, i.e. when the epicenters are located on the country rock (granofel, CBGN) or on the intrusive rock (granodiorite), the P axes (azimuth measured clockwise from north) are remarkably consistent, and lie between 80 and 92^{o}. We have two possible slip vectors, one set striking 90 - 120^{o} and the other 225 - 265^{o}, both indicating a northerly striking fault plane. We examined other data to decide between the two.

In Group C, we again get consistent P axes directions (53 - 66^{o}) (indicating a NW - SE fault plane) but the calculated slip vectors are not consistent. Two solutions included in Group C are for deeper events.

So, we obtain two sets of fault plane solutions, with two sets of consistent P axes. The P (compressional) axis is usually taken to represent the direction of the maximum stress. Here we have obtained TWO P axes. As there should be only one direction of maximum stress in so small an area, we conclude that one or both inferred directions of maximum stress are erroneous. However, because the P axes were obtained from the orientation of the fault planes, we conclude, the different orientations of the fault planes indicate that the earthquakes are occurring along differently oriented EXISTING FRACTURES. These are oriented NS in the country rocks (Group A) and NW in the migmatite (Group C). The NW orientation seems to represent the regional picture. This is because a) the deeper events (Cluster IV, Solutions 3 and 4) are aligned in that direction together with those in the migmatite zone. (The fractures in the migmatite zone, forming last, would attain an orientation resulting from that of the ambient stress field), and b) the regional direction of jointing is NW - SE. Thus the P axes obtained for epicenters on the country rock, do NOT represent the tectonic stress directions, whereas those obtained from Group C do. The events comprising Group B are in shallow migmatite and probably reflect local orientation of fractures. The spatial association of different fault plane orientations is summarized in Figure 47. (The earthquake clusters plotted are for the period July - October 1978).

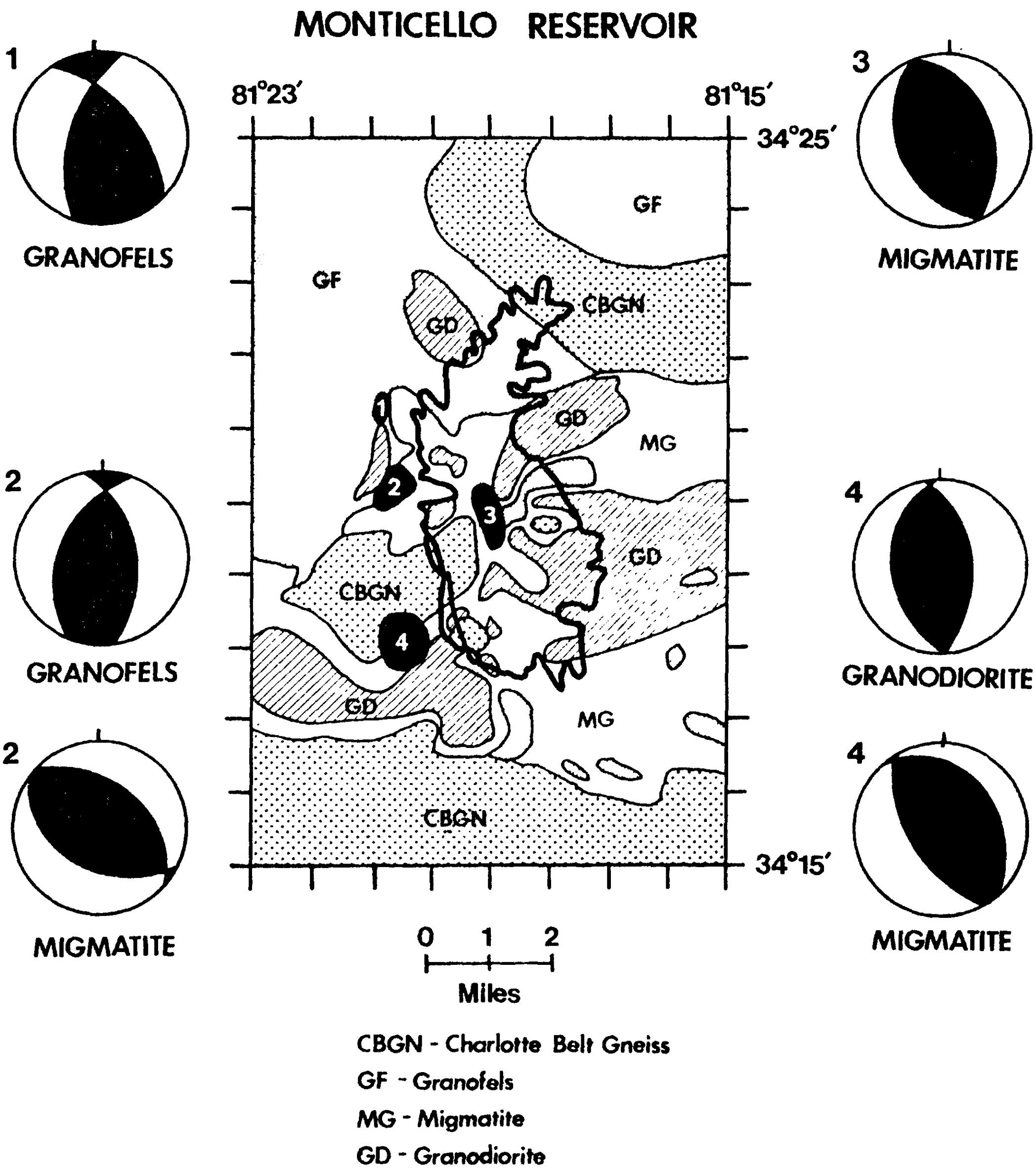

MONTICELLO RESERVOIR
81°23′
81°15′
34°25′
34°15′
GF
CBGN
GD
MG
1
2
3
4
0 1 2
Miles
GRANOFELS
MIGMATITE
GRANODIORITE
CBGN - Charlotte Belt Gneiss
GF - Granofels
MG - Migmatite
GD - Granodiorite

Figure 47

TABLE 11

GEOLOGIC ASSOCIATIONS WITH FPS DATA

	CLUSTER (SOLUTION)	GEOLOGIC UNIT	P AZIMUTH	DIP	SLIP VECTOR 1.	AZIMUTH 2.
A	I (1)	Granofel	80^o	7^o	108^o	228^o
	II (1)	Granofel	90^o	16^o	104^o	260^o
	II (2)	Granodiorite	83^o	0^o	118^o	227^o
	III (2)	CBGN	92^o	10^o	119^o	253^o
	IV (1)	Mixed (?)	87^o	17^o	90^o	264^o
B	II (3)	Migmatite	34^o	4^o	31^o	217^o
	V (1)	?	47^o	21^o	47^o	227^o
C	III (1)	Migmatite	62^o	6^o	67^o	237^o
	IV (2)	Mixed (?)	62^o	11^o	44^o	254^o
	IV (3)	Mixed (?)	53^o	7^o	83^o	202^o
	IV (4)	Mixed (?)	66^o	8^o	34^o	272^o

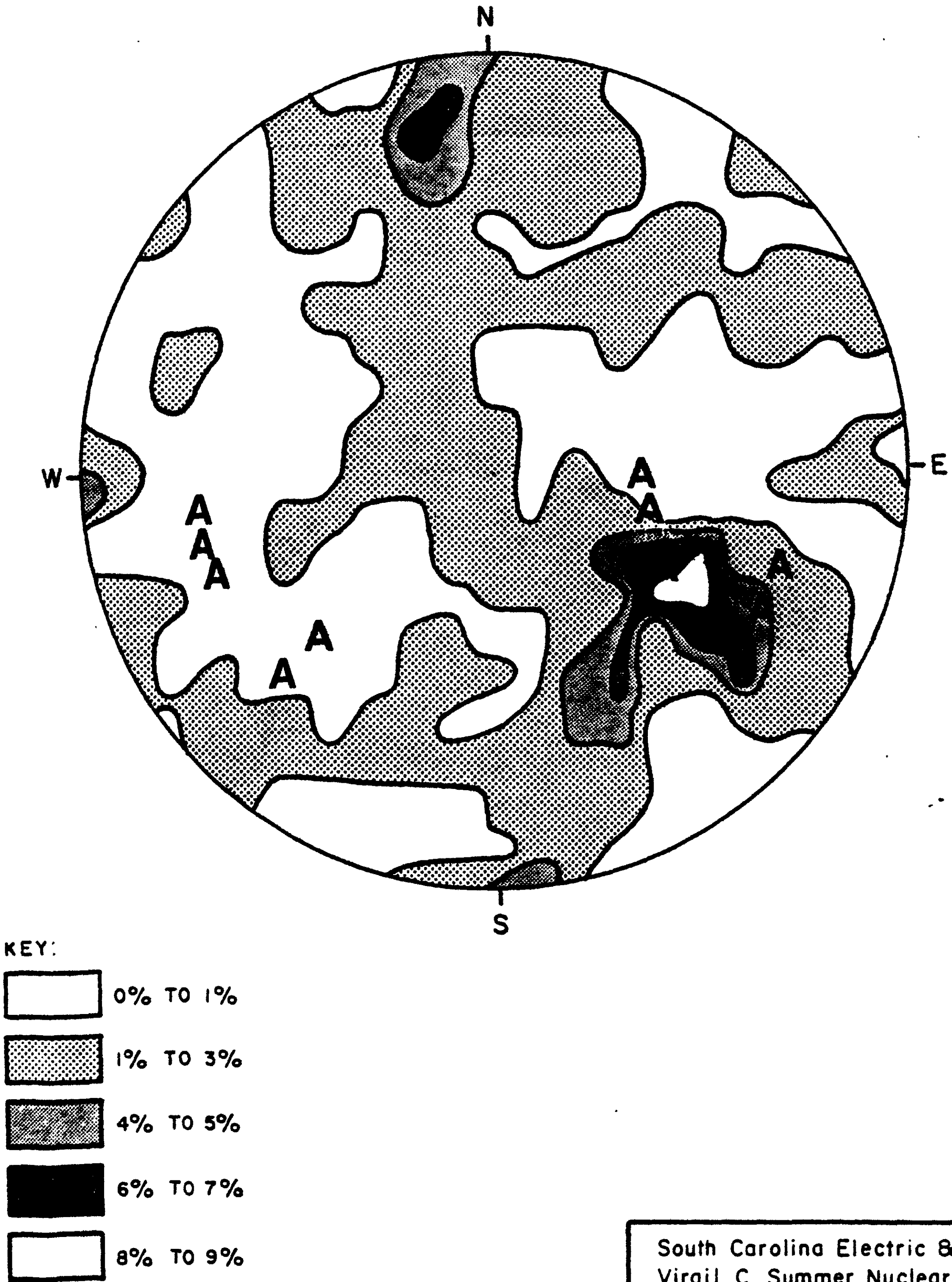
V.3 . *Comparison with other data*

In this section we compare our results with those obtained by South Carolina Electric and Gas (1977). The following is taken almost verbatim from SCE&G (1977).

"A statistical analysis of foliation and compositional bedding planes in the general site area (within a 10 mile radius of the site) indicates a major disruption of country rocks by pluton emplacement. The Areal Foliation Contour Diagram, Figure 48, presents a plot of 108 such planes from the entire mapped area, and indicates a shift from the N70E average trend in the general area to about N50E, with dips spread unevenly to the southeast and northwest. Both the shift from regional strke and the uneven distribution can be attributed to the disruption resulting from plutonic emplacements. Plutonic rocks have been mapped as fingers, irregular zones, and as small to moderately large plutons which generally trend in an east-west pattern, indicating a general concordance or structural relationship.

The northwest contact with the country rock east of Broad River is concordant, while the others are moderately discordant, probably reflecting the influence of a joint system. Smaller granodiorite plutons are found north and east of the nuclear plant site. Precise boundaries of the plutons are difficult to determine because of the peripheral zones of migmatite. The altered character of the migmatites seems to increase as the plutons are approached.

The high density zone in the lower right quadrant of Figure 48 represents points north of, and adjacent to, the site. This area strikes N43E and dips moderately to the southeast, possibly forming the southeastern limb of a northeast striking anticline. The N43E strike of this area deviates



South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

Areal Foliation Contour Diagram

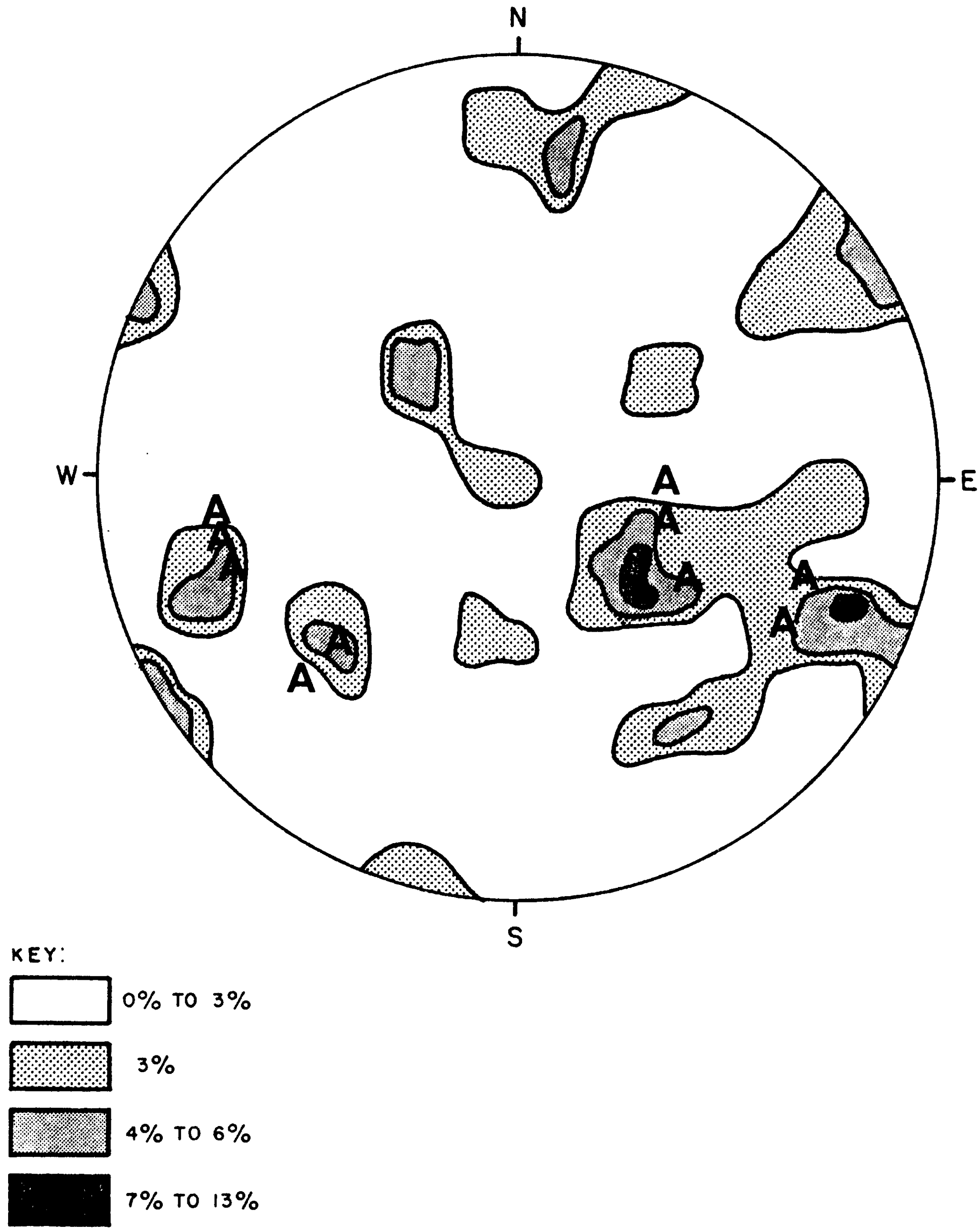
Figure 48

approximately 25^{o} from the usual regional strike, and the isolated density concentrations at the east, south, and west edges of the figure indicate that distrubance is present to some degree.

The density zone near the northern edge of Figure 48 represents foliation planes located several miles south of the site. The general strike of this area is N78E and closely approximates the regional strike. The dip is steep to the northwest, indicating the presence of the southern limbs of the synclines. The high density areas of this figure are much broader than foliation contour diagrams of nearby localities prepared by others, indicating a significant pluton influence within the general site area.

Figure 49, the Pluton Area Foliation Contour Diagram, represents a plot of 30 planes from areas of known pluton emplacement. The irregular distribution of high-density zones is very apparent, illustrating the disruptive effect of plutons on older metamorphic rocks. The field and core data (increasing granitization with depth) enhance the probability of subsurface plutons which disturb northeast-southwest trending folds of metamorphic rocks.

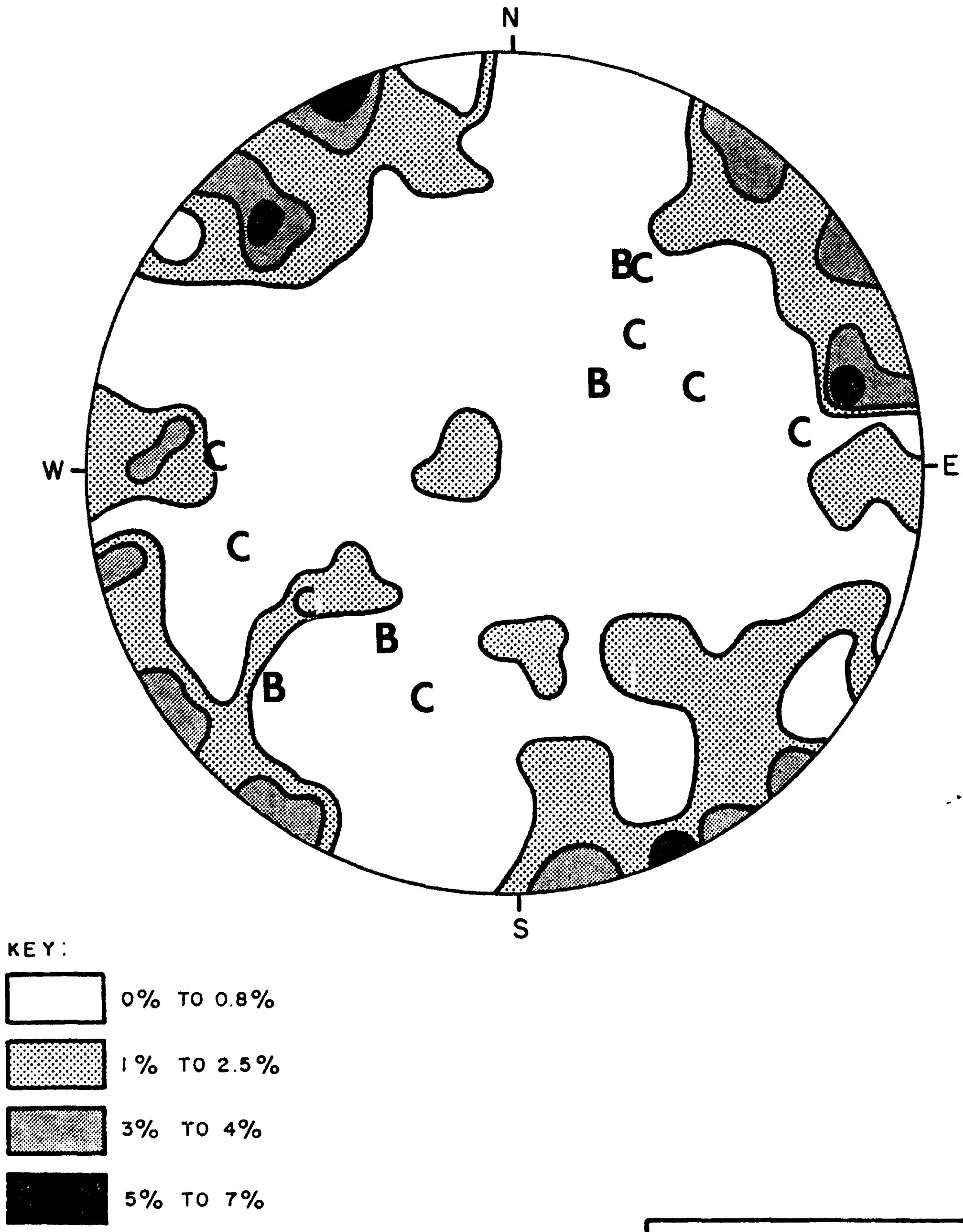
A well developed joint system was observed in most rocks in the mapped area. The Areal Joint Contour Diagram, Figure 50, represents a statistical analysis of more than 135 joints from the area mapped, and exhibits a system for which the prevailing directions are N30W with an approximate dip of 80^{o} northeast and N67E dipping vertically. The secondary set averages N45E and dips approximately 80^{o} northwest. These joint sets probably represent a combination of vertical diagonal shear jointing, with longitudinal and cross-tension joints, all related to folding. The joint system enhanced



South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

Pluton Area Foliation
Contour Diagram

Figure 49



South Carolina Electric & Gas Co.
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Areal Joint Contour Diagram

Figure 50

development of a trellised drainage pattern which alters to dendritic where influenced by pluton emplacement."

The slip vector corresponding to any fault plane is obtained at the intersection of that plane with a plane through the P and T axes. That is, the pole of one nodal plane is the slip vector of the other nodal plane. Thus the slip vectors of each fault plane represents the pole of the second fault plane. So the slip vectors plotted obtained in Table 11 represent the poles of the fault planes obtained from composite fault plane solutions. These poles can then be compared with the poles of foliations and joints obtained by surface mapping. In Figures 48 and 49 the slip vectors of cfps in Group A (Table 11) are superposed on foliation contour diagrams in the general area. In Figure 48 the high density zone in the lower quadrant represents points north of, and adjacent to site (SCE&G, 1977). This high density zone is also the location of poles in Group A (A on Figure 48). This suggests that the earthquakes in Group A are occurring along N to NE striking fault planes if the surface foliations prevail to hypocentral depths.

The poles corresponding to earthquakes in sets B and C (Table 11) have been superposed on Figure 50. Here we note that the faulting is associated with NW set of joints, which predominates. (In surficial mapping of the joints it is easy to miss the horizontal and gently dipping probably explaining their absence,Figure 50).

V.4. *Conclusions*

If our interpretation of the observations presented above are correct we can make the following conclusions:

a. The seismicity is shallow (< 2 km). There is some evidence to suggest that initially it was shallower (< 1 km).

b. The seismicity appears to spread in discrete jumps, both laterally and downwards. This spreading is not smooth owing to the very heterogeneous nature of the rocks.

c. The seismicity occurs along existing joint and fracture planes rather than by breaking new rock. (Essentially the same conclusion was reached by Duc (1980) based on the fracture energy assocaited with the August 27, 1978 event.)

d. The seismicity which began soon after the initial impoundment of the reservoir is caused by changes in pore pressures at hypocentral depths. These changes are caused by the diffusion of pore pressure resulting from changes in the reservoir water levels. (This conclusion is based on results presented at the 1979 annual SSA meeting, Talwani and Rastogi, 1979).

e. The thrust fault mechanisms observed for the shallow events suggest the existence of large horizontal stresses at shallow depths. This conclusion is borne out by in situ stress measurements in the two deep wells.

REFERENCES

Duc, A. C. (1980) Source properties of Induced Earthquakes at Monticello reservoir, South Carolina, M.S. Thesis, (Unpubl.) University of South Carolina, 151 pp.

Fyfe, W. S., N. J. Price and A. B. Thompson (1978) Fluids in the Earth's Crust, Elsevier, Amsterdam, 383 pp.

Gutenberg, B., and C. F. Richter (1956) Magnitude and energy of Earthquakes, *Ann. Geof. 9*, p. 1-15.

Haimson, B. D. (1975) Hydrofracturing stress measurements, Bad Creek Pumped Storage project, Report for Duke Power Company, 19 pp.

Lee, W. H. K., and J. C. Lahr (1972) A computer program for determining hypocenter, magnitude and first motion pattern of local earthquakes. Revision of HYPO71, *USGS* Open File Report, 100 pp.

Schaeffer, M. F., R. E. Steffans and R. D. Hatcher (1979) In-situ stress and its relationship to joint formation in the Toxaway gneiss, Northwestern South Carolina, *Southeastern Geology, 20*, pp. 129-143.

South Carolina Electric and Gas Compnay, V. C. Summer Nuclear Station Final Safety Analysis report to U. S. Nuclear Regulatory Commission, Vol. II, 1977.

Talwani, P., D. Stevenson, J. Sauber, B. K. Rastogi, A. Drew, J. Chiang and D. Amick (1978) Seismicity Studies at Lake Jocassee, Lake Keowee and Monticello reservoir, South Carolina (October 1977 - March 1978). Seventh Technical Report to U. S. Geological Survey, Contract No. 14-08-0001-14553, 1978, 190 pp.

Talwani, P. (1979) Induced seismicity and Earthquake Prediction studies in South Carolina, Eighth Technical Report to U. S. Geological Survey, Contract No. 14-08-0001-14553, 36 pp.

Talwani, P. and B. K. Rastogi (1979) Mechanism for reservoir Induced seismicity, Abstracts of papers presented at 74th Annual Meeting of Seismological Soc. Am., *Earthquake Notes, 49,* No. 4, p. 59.

APPENDICES

APPENDIX I

LOCATIONS OF SEISMIC STATIONS AT LAKE JOCASSEE

NO.	STN	LAT N	LONG W
1	BL2	$34^{o}57.92'$	$82^{o}57.24'$
2	KTS	$34^{o}56.00'$	$82^{o}53.08'$
3	BG3	$34^{o}59.58'$	$82^{o}55.90'$
6	PFS	$34^{o}58.50'$	$83^{o}00.29'$
7	SMT	$34^{o}55.85'$	$82^{o}58.26'$
24	LPM	$34^{o}58.75'$	$83^{o}01.46'$

APPENDIX II

LAKE JOCASSEE VELOCITY MODEL

VELOCITY km/sec	DEPTH km
4.50	0.00
5.75	0.28
6.20	1.22
8.10	30.00

APPENDIX III

LIST OF EVENTS FROM MARCH 1978 - SEPTEMBER 1979

In column 3 the "station of max. duration" refers to the location of a station where the recorded duration event was maximum. The station number corresponds to that listed in Appendix I. The maximum recorded duration for any event is given in column 4. In column 5 are listed the total number of stations recording the event. The daily energy release is listed in column 6. The daily energy is calculated using a simplified magnitude - energy relation (Gutenberg and Richter, 1956), i.e.,

$$\log_{10} E = 11.8 + 1.5\ M_L$$

where M_L = calculated duration magnitude. For Jocassee (Talwani and others, 1976)

$$M_L = -1.83 + 2.04 \log D$$

where D = duration of event in seconds. Events with magnitude $\geqslant 1$ are listed in column 7.

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1.0$
78:03:02	11:27:12	3	5	3	1.5×10^{11}	
78:03:05	23:44:46	1	3	3	7.8×10^{10}	
78:03:06	11:12:09	6	4	5	7.8×10^{10}	
78:03:11	14:37:34	6	5	3	1.5×10^{11}	
78:03:17	12:28:24	6	3	1	3.2×10^{10}	
78:03:18	04:28:39	6	2	2		
	12:36:56	6	2	1		
	20:35:02	6	3	1	5.1×10^{10}	
78:03:21	04:37:49	3	3	4		
	05:12:46	3	6	4	3.0×10^{11}	
78:03:22	09:18:26	3	2	4	9.3×10^{9}	
78:03:24	16:37:15	3	6	4	2.7×10^{11}	
78:03:25	00:43:12	3	14	4	3.6×10^{12}	
78:03:29	10:42:11	3	3	4	3.2×10^{10}	
78:03:30	01:39:08	3	7	5		
	02:03:12	3	2	1		
	02:29:58	3	6	4		
	03:16:16	3	6	4		
	04:37:11	3	6	4		
	05:09:09	6	5	2		
	05:48:34	3	24	5		
	05:57:46	3	3	2		
	06:10:50	3	2	3		
	06:10:54	3	7	5		
	07:02:26	2	13	4		
	08:37:28	3	2	1	2.4×10^{13}	
78:03:31	06:39:08	3	2	1		
	06:40:39	3	2	2		
	09:38:51	3	6	5		
	11:12:57	3	5	4		
	11:58:05	3	6	4		
78:04:01	11:53:28	3	6	5	2.7×10^{11}	
78:04:04	09:11:23	2	30	5	3.7×10^{13}	1.4
78:04:08	15:15:01	1	15	4	4.5×10^{12}	
78:04:11	00:49:25	2	32	5	4.6×10^{13}	1.5
78:04:12	14:09:28	2	6	5	2.7×10^{11}	

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1.0$
78:04:17	17:20:51	1	2	1	9.3×10^{9}	
78:04:18	11:16:27	1	4	3	7.8×10^{10}	
78:04:20	21:01:45	2	3	1	3.2×10^{10}	
78:04:21	11:10:33	1	3	2	3.2×10^{10}	
78:04:23	06:35:31	1	5	3	1.5×10^{11}	
78:04:27	20:30:48	1	4	4	7.8×10^{10}	
78:04:28	01:56:01	3	10	4		
	02:54:51	6	8	4		
	19:25:46	6	3	1		
	23:52:10	6	8	3	2.6×10^{12}	
78:04:29	15:13:10	6	7	5	1.5×10^{11}	
78:04:30	08:34:37	3	5	3		
	13:33:52	3	8	3	8.1×10^{11}	
78:05:03	19:05:20	1	2	3	9.3×10^{9}	
78:05:05	23:01:20	1	2	3	9.3×10^{9}	
78:05:09	06:14:47	3	3	4		
	08:29:38	2	14	5	3.6×10^{12}	
78:05:10	03:32:46	2	34	5	5.5×10^{13}	
78:05:11	20:11:33	3	5	3	1.5×10^{11}	
78:05:12	08:32:05	1	2	2		
	09:29:56	1	2	1		
	13:39:01	3	28	4		1.4
	13:40:25	3	6	1		
	14:15:17	3	34	4		1.3
	14:24:43	3	4	1		
	16:20:15	1	5	1	8.5×10^{13}	
78:05:13	01:34:13	1	2	3		
	07:09:25	1	2	1	1.9×10^{10}	
78:05:14	00:43:50	1	8	5		
	06:03:35	1	2	1		
	11:09:39	1	4	2		
	11:09:55	1	9	5		
	11:12:04	1	2	1		
	11:23:18	1	2	1	2.0×10^{12}	

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1.0$
78:05:18	09:05:06	1	2	2		
	10:59:01	1	2	2		
	12:55:05	1	2	2	2.8×10^{10}	
78:05:19	06:06:52	1	6	5		
	09:27:17	1	3	2	3.0×10^{11}	
78:05:20	02:04:29	2	8	4	6.5×10^{11}	
78:05:21	01:52:20	3	2	1	9.3×10^{9}	
78:05:22	09:27:50	1	3	4		
	20:41:52	3	2	1	4.2×10^{10}	
78:05:23	08:07:13	2	30	5		1.2
	12:29:24	2	35	5		1.5
	12:31:10	3	5	3		
	12:32:28	3	2	1		
	15:22:53	3	2	2	9.8×10^{13}	
			3			
78:05:26	16:33:11	3	10	5	1.3×10^{12}	
78:05:27	04:52:02	2	3	4	3.2×10^{10}	
78:05:31	13:46:41	2	4	2	7.8×10^{10}	

DATE	TIME H:M:S	STN. OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:06:01	16:32:25	2	49	5	1.6×10^4	1.6
78:06:03	01:56:32	1	3	2	4.0×10^{10}	
	07:09:35	1	2	2		
78:06:05	13:19:15	1	4	3	7.8×10^{10}	
78:06:06	22:23:45	1	3	3	3.2×10^{10}	
78:06:08	01:55:09	1	2	2	7.9×10^9	
78:06:09	04:45:45	3	5	4	3.2×10^{11}	
	04:47:50	2	5	4		
78:06:10	13:02:30	3	2	1	7.9×10^9	
78:06:11	10:46:06	3	4	4	3.2×10^{13}	
	10:47:28	1	2	1		
	16:09:50	1	2	1		
	16:22:01	2	26	5		1.1
	18:30:41	3	2	1		
	19:28:48	2	17	5		
	19:29:19	3	1	1		
	20:24:11	3	3	1		
	20:40:02	3	1	1		
	21:25:32	3	1	1		
78:06:12	02:47:32	1	2	3	3.2×10^{11}	
	02:49:39	3	6	3		
	03:47:12	1	2	2		
	03:48:01	1	2	2		
	05:33:30	3	3	3		
78:06:13	20:50:21	3	4	2	1.9×10^{10}	
	22:43:02	1	2	2		
78:06:15	00:38:42	1	2	1	2.2×10^{11}	
	06:22:59	1	2	2		
	13:53:00	2	4	2		
	14:04:04	1	4	3		
	14:10:18	2	2	3		
	14:26:21	1	3	3		
78:06:16	23:10:09	1	2	3	7.9×10^9	
78:06:17	10:02:29	1	3	3	3.2×10^{10}	

DATE	TIME H:M:S	STN. OF MAX. DURATION	DURATION (SEC)	NO. OF STN. REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:06:18	12:04:52	6	6	4	3.2×10^{11}	
	21:14:47	3	3	2		
78:06:19	01:17:32	3	2	1	3.6×10^{12}	
	14:09:51	2	14	4		
78:06:20	07:33:13	6	3	4	3.2×10^{10}	
78:06:22	08:00:21	3	5	4	1.6×10^{11}	
78:06:23	00:47:16	1	3	4	7.9×10^{11}	
	00:50:32	1	3	3		
	02:12:31	6	7	5		
	02:49:45	3	3	2		
	07:41:17	3	6	5		
78:06:24	13:56:23	1	5	5	1.6×10^{11}	
78:06:25	08:06:21	1	2	1	1.3×10^{12}	
	12:23:34	2	10	5		
78:06:27	06:03:38	3	30	5	3.8×10^{13}	1.2
	06:28:48	3	6	3		
	06:21:57	3	7	1		
	07:17:43	3	6	1		
78:06:30	05:34:50	6	6	5	2.5×10^{11}	
78:07:02	14:26:02	1	10	5	1.3×10^{12}	
78:07:04	04:22:03	3	2	1		
	04:27:47	3	2	1	1.3×10^{11}	
	04:45:24	3	4	5		
	08:24:27	3	3	2		
78:07:07	01:30:20	3	12	4	3.9×10^{12}	
	09:08:12	3	5	2		
	10:36:02	2	10	4		
	10:44:34	3	2	1		
	20:06:	1	5	4		
78:07:08	00:42:	3	5	4	1.6×10^{11}	
78:07:09	13:11:35	3	7	5	1.4×10^{12}	
	15:57:52	2	9	4		
78:07:10	23:07:	3	6	4	2.7×10^{11}	

DATE	TIME H:M:S	STN. OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1$
78:07:11	06:45:	1	4	4	7.9×10^{10}	
78:07:12						
78:07:14	02:37:	1		5		
78:07:16	02:42:	1		5		
78:07:19	11:55:26	2	7	5	4.4×10^{11}	
78:07:21	01:05:16	1	1	2	1.1×10^{9}	
78:07:22	15:18:56	3	27	5	2.7×10^{13}	1.1
78:08:02	17:21:16	1	6	3	2.7×10^{11}	
78:08:10	07:49:39	1	6	5	2.7×10^{11}	
78:08:12	06:31:25	3	6	5	2.7×10^{11}	
78:08:13	08:16:02	2	6	3	2.7×10^{11}	
78:08:15	01:48:24	3	6	5	2.7×10^{11}	
78:08:16	21:59:17	3	6	5	2.8×10^{11}	
	22:38:48	3	2	3		
78:08:17	05:08:29	3	54	5	2.2×10^{14}	1.7
78:08:18	15:28:27	2	18	5	7.8×10^{12}	
78:08:21	11:37:37	1	2	1	1.6×10^{15}	
	12:53:13	3	5	3		
	13:53:01	7	103	5		2.3
78:08:22	04:28:23	2	3	4	3.2×10^{10}	
78:08:24	17:59:46	1	2	2	2.1×10^{10}	
	17:59:54	1	1	3		
	19:59:59	1	1	2		
	22:00:42	1	2	2		
78:08:25	00:44:49	1	2	1	7.9×10^{9}	
78:08:26	17:11:13	2	11	3	2.0×10^{12}	
	22:58:31	3	6	5		

DATE	TIME H:M:S	STN. OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1$
78:08:27	13:00:09	6	6	5	2.8×10^{11}	
	14:52:46	3	2	1		
78:08:31	06:05:51	2	10	5	1.3×10^{12}	

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:09:02	15:50:50	3	2	1	1.89×10^{10}	
	15:51:27	3	2	1		
78:09:04	12:25:03	2	5	5	2.35×10^{11}	
	15:18:00	2	4	3		
78:09:06	09:30:19	1	2	1	8.43×10^{10}	
	10:33:22	1	2	1		
	10:50:09	1	3	1		
	11:17:16	1	3	1		
78:09:09	16:50:24	1	2	2	9.47×10^{9}	
78:09:10	19:06:14	1	6	2	2.73×10^{11}	
78:09:11	11:55:08	3	35	4	6.02×10^{13}	1.32
78:09:14	01:58:14	6	6	3	4.29×10^{11}	
	01:58:20	3	5	3		
78:09:16	09:13:50	7	50	5	3.58×10^{14}	1.64
	09:55:05	3	6	4		
	16:36:27	2	50	5		1.64
78:09:19	03:35:37	7	5	5	2.35×10^{11}	
	03:41:40	1	4	5		
78:09:21	07:08:00	7	110	5	2.00×10^{15}	2.33
	07:30:55	3	12	5		
	09:57:22	3	3	3		
	12:00:29	3	2	2		
	12:09:01	3	2	2		
78:09:22	23:16:03	3	60	5	3.13×10^{14}	1.80
78:09:23	02:20:42	3	4	3	9.22×10^{13}	
	05:41:30	3	5	3		
	05:50:17	3	10	5		
	09:41:21	1	3	2		
	18:03:57	7	40	5		1.44
	19:26:50	3	3	3		
78:09:24	09:46:43	3	2	2	9.47×10^{9}	
78:09:26	01:09:51	1	50	4	5.25×10^{14}	1.64
	01:57:27	3	4	2		
	03:11:51	2	4	4		
	04:51:42	3	4	4		
	07:27:28	3	5	4		
	19:18:38	3	2	3		
	19:48:49	3	2	3		
	20:10:18	2	63	5		1.84

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:09:27	10:30:31	2	8	5	1.05×10^{12}	
	11:35:44	3	5	5		
	15:28:07	3	5	5		
	18:44:08	3	4	5		
78:09:28	05:03:18	3	3	5	1.17×10^{12}	
	15:40:41	3	6	5		
	16:30:10	3	5	4		
	18:19:42	3	7	5		
	18:21:49	7	6	5		
78:09:29	08:59:25	3	1	1	8.00×10^{10}	
	11:57:25	3	4	3		
78:09:30	23:31:49	7	4	3	7.89×10^{10}	
78:10:02	03:16:01	2	3	1	7.89×10^{10}	
78:10:03	06:59:34	7	30	5	3.76×10^{13}	
	08:04:50	1	3	5		
78:10:04	20:27:10	3	7	2	2.87×10^{12}	
	21:16:28	3	5	2		
	23:03:21	2	12	5		
78:10:05	12:24:56	2	50	5	9.35×10^{14}	1.64
	12:31:11	2	80	5		2.05
78:10:08	22:59:51	3	8	3	6.58×10^{11}	
78:10:09	00:42:00	3	5	2	5.85×10^{11}	
	01:04:30	3	5	3		
	04:59:09	3	6	2		
	23:45:46		4	3		
78:10:14	14:59:15	3	6	5	3.15×10^{11}	
	15:52:34	3	2	2		
	20:44:45	3	3	3		
78:10:16	08:58:08	3	1	1	1.14×10^{9}	
78:10:17	04:14:54	2	2	2	4.58×10^{13}	
	11:42:27	3	25	5		1.02
	12:06:39	2	26	2		1.06
78:10:18	02:07:17	6	3	5	6.27×10^{11}	
	05:02:55	2	5	5		
	07:55:04	2	7	5		

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L > 1$
78:10:19	08:53:45	3	1	1	3.38×10^{10}	
	08:59:36	3	3	1		
78:10:20	05:31:00	3	22	6	1.45×10^{13}	
78:10:21	11:10:33	3	2	2	9.47×10^{9}	
78:10:22	03:04:04	1	2	1	2.00×10^{10}	
	03:23:58	1	1	1		
	04:09:59	1	2	4		
78:10:25	03:21:41	1	3	1	3.27×10^{10}	
78:10:26	02:55:43	1	2	2	4.20×10^{10}	
	11:52:49	7	3	2		
78:10:29	12:22:39	3	4	6	7.89×10^{10}	
78:10:30	01:47:22	1	2	1	1.98×10^{11}	
	10:10:54	2	5	4		
	11:47:30	5	3	3		
78:10:31	19:50:43	1	2	2	1.89×10^{10}	
	20:16:44	1	2	2		
78:11:04	04:07:18	6	3	5	3.27×10^{10}	
78:11:08	00:06:15	3	3	2	1.44×10^{11}	
	09:31:16	5	4	5		
	14:21:27	5	3	3		
78:11:09	03:47:02	1	2	1	9.47×10^{9}	
78:11:10	22:36:34	1	3	3	3.27×10^{10}	
78:11:12	20:41:24	1	5	5	1.56×10^{11}	
78:11:13	22:49:01	7	5	4	1.56×10^{11}	
78:11:14	11:03:56	1	2	2	9.47×10^{9}	
78:11:18	12:08:43	7	23	6	1.67×10^{13}	
78:11:19	16:19:49	1	6	5	2.73×10^{11}	
78:11:30	08:54:19	2	3	5	1.88×10^{11}	
	13:11:54	2	5	4		
78:12:05	23:46:42	7	5	6	9.07×10^{12}	
	23:58:50	7	40	6		1.44
	23:59:22	1	1	2		

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:12:06	03:47:49	7	3	2	5.04×10^{12}	
	04:39:18	7	2	2		
	06:48:00	2	7	4		
	06:48:18	1	2	3		
	08:56:40	2	2	3		
	23:15:59	6	3	1		
	23:26:55	2	15	6		
78:12:07	04:02:39	6	7	1	7.11×10^{11}	
	07:31:01	6	6	4		
78:12:11	00:58:12	6	3	3	3.27×10^{10}	
78:12:16	08:02:10	6	8	5	7.56×10^{11}	
	22:40:06	7	3	2		
	22:45:30	7	3	2		
	23:10:32	7	3	2		
78:12:18	04:09:44	7	60	6	3.21×10^{14}	1.80
	04:10:14	6	8	3		
	04:10:48	6	1	1		
	04:11:25	6	1	1		
	04:11:44	6	1	2		
	04:11:46	6	1	2		
	04:11:47	6	1	1		
	04:11:48	6	2	2		
	04:15:31	6	2	2		
	04:15:55	6	5	2		
	04:19:35	6	1	1		
	04:20:29	6	2	1		
	04:22:08	6	1	1		
	04:27:35	6	1	2		
	04:27:43	6	3	2		
	04:33:23	6	1	1		
	04:35:04	6	1	1		
	04:40:28	6	1	1		
	04:59:04	6	6	5		
	05:17:11	6	18	6		
	05:19:37	6	1	1		
	05:23:15	6	1	1		
	05:23:19	6	1	1		
	05:23:56	6	1	1		
	05:24:08	6	1	1		
	05:24:49	6	1	1		
	05:24:51	6	1	1		
	05:27:00	6	1	1		
	05:28:43	6	1	1		
	05:30:30	6	9	5		
	05:49:45	6	1	1		
	05:52:42	6	6	3		

DATE	TIME H:M:S	STN OF MAX. DURATION	DURATION (SEC)	NO. OF STN REC. EVENT	ENERGY PER DAY (ERGS)	$M_L>1$
78:12:18	05:54:03	6	1	1		
	06:14:11	6	1	1		
	06:29:15	6	2	1		
	06:50:12	6	2	1		
	06:50:16	6	2	1		
	10:46:57	6	5	5		
78:12:20	02:26:10	6	3	2	5.95×10^{14}	
	05:37:56	7	65	6		1.87
	05:40:15	2	2	1		
	05:40:32	2	6	2		
	05:45:54	2	6	2		
	05:49:17	2	8	4		
	05:50:08	7	30	6		1.18
	05:51:30	2	2	1		
	05:57:20	2	12	4		
	05:58:50	2	9	5		
	06:02:13	2	7	2		
	06:16:40	7	45	6		1.54
78:12:24	12:46:26	1	3	2	2.15×10^{13}	
	15:41:32	1	3	1		
	15:45:22	1	25	6		1.02
78:12:26	01:09:39	6	12	4	2.36×10^{12}	
	03:47:17	1	2	2		
	12:30:32	7	4	3		
78:12:29	08:53:57	1	2	3	1.09×10^{13}	
	20:03:30	1	20	5		

DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790101	01:24:21	6	15	3	5.56×10^{12}	
	06:35:10	1	3	2		
790103	13:24:57	1	4	3		
790107	02:53:30	1	2	1	9.50×10^{9}	
790109	11:22:47	1	18	5	7.85×10^{12}	
790110	17:14:44	1	2	3	9.50×10^{9}	
790122	04:10:14	3	5	5	2.51×10^{11}	
790129	06:50:32	7	3	1	3.67×10^{12}	
	11:10:49	7	8	3		
	11:59:44	7	12	3		
	13:28:50	7	3	2		
790130	18:52:32	7	6	3	2.75×10^{11}	
790131	17:16:03	3	5	2	2.51×10^{11}	
790203	00:48:39	3	5	2	2.75×10^{11}	
	15:53:37	3	4	2		
790205	18:53:37	3	40	3	9.12×10^{13}	1.44
790208	04:37:29	3	2	2	3.24×10^{10}	
	04:37:33	3	2	2		
	05:29:32	3	2	2		
790210	13:00:06	7	2	1	9.50×10^{9}	
790213	10:30:27	3	10	2	2.40×10^{14}	
	10:36:54	3	8	2		
	15:07:39	3	55	3		1.72
	16:45:04	3	8	3		
790222	04:22:18	3	4	2	7.94×10^{10}	
790301	14:33:28	3	4	2	7.94×10^{10}	
790303	16:45:38	7	7	3	4.37×10^{11}	
790306	14:00:33	7	6	2	2.75×10^{11}	
790307	05:18:42	7	6	2	2.75×10^{11}	
790309	16:56:57	7	5	2	2.51×10^{11}	

DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790320	13:25:40	3	2	2		
	14:18:47	7	45	3	1.29×10^{14}	1.54
	23:32:06	3	5	3		
790321	00:25:51	3	2	3		
	11:22:51	24	15	3	4.52×10^{12}	
790330	08:40:56	3	6	1	2.75×10^{11}	
790403	18:16:28	3	3	2	2.75×10^{11}	
	19:29:59	24	4	2		
	23:37:37	3	4	2		
790406	23:52:18	3	35	2	6.03×10^{13}	
790407	00:20:53	3	25	3	8.20×10^{13}	
	03:50:08	3	3	1		
	04:03:06	3	7	2		
	04:07:51	3	2	1		
	04:10:39	3	7	2		
	14:22:25	3	3	1		
	14:40:34	7	35	3		
790410	04:10:16	3	2	1	1.58×10^{11}	
790417	06:40:57	3	4	1	7.94×10^{10}	
790424	06:29:32	7	4	1	2.75×10^{11}	
	09:08:25	7	4	1		
	14:24:42	7	2	2		
	14:25:08	7	3	2		
790425	02:33:03	3	6	3	2.75×10^{11}	
790427	22:59:33	3	45	2	1.20×10^{14}	1.52
790428	00:19:23	3	20	2	6.65×10^{13}	
	02:15:48	3	15	2		
	05:07:20	3	33	3		1.27
790429	13:57:45	7	2	1	1.58×10^{11}	
790501	20:39:60	3	125	3	2.99×10^{15}	2.45
790507	23:56:16	3	4	1	7.94×10^{10}	
790513	17:23:15	3	15	1	4.52×10^{12}	
790514	21:46:59	7	4	3	7.94×10^{10}	

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DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790518	00:52:33	7	8	3	6.53×10^{11}	
790520	15:50:42	7	3	1	3.24×10^{10}	
790528	04:16:50	3	6	2	3.43×10^{15}	
	11:45:28	3	10	3		
	11:45:38	7	130	3		2.49
	11:48:37	3	2	2		
	11:49:01	3	5	2		
	11:52:27	3	3	2		
	11:57:47	3	4	2		
	11:57:58	3	2	2		
	11:59:19	3	2	2		
	12:04:47	3	10	2		
	12:11:39	3	5	2		
	12:35:14	3	7	2		
	12:35:37	3	3	2		
	12:36:19	3	4	2		
	12:41:48	3	2	2		
	12:56:34	3	2	2		
	12:59:54	3	7	2		
	13:56:39	3	5	2		
790529	06:45:30	3	4	2	1.58×10^{11}	
790530	12:29:20	3	5	2	2.51×10^{11}	
790531	23:22:16	3	2	3	3.24×10^{10}	
790601	07:57:44	24	3	1	3.24×10^{10}	
790602	00:40:45	7	3	2	6.46×10^{10}	
790603	10:13:27	3	3	1	1.55×10^{11}	
	18:10:18	24	3	3		
790604	08:52:45	7	2	2	9.50×10^{9}	
790606	23:39:02	3	9	3	9.33×10^{11}	
790608	15:59:29	3	15	3	4.52×10^{12}	
790609	01:08:53	3	7	3	5.89×10^{11}	
	13:36:31	3	5	3		
790610	14:38:38	3	25	3	2.19×10^{13}	
	22:16:37	7	3	1		
790611	00:49:26	24	3	1		
	06:59:36	7	20	3	1.10×10^{13}	

DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790613	08:08:18	7	3	1	3.63×10^{12}	
	09:50:34	3	14	3		
790614	14:22:03	7	3	1	3.24×10^{10}	
790627	05:25:11	3	2	2	1.45×10^{11}	
	05:31:45	7	4	2		
	05:31:55	7	3	2		
790628	13:15:33	3	6	2	2.57×10^{11}	
790630	11:27:34	7	4	1	7.94×10^{10}	
790705	11:24:54	7	3	2	7.90×10^{9}	
790708	09:51:08	3	35	2	6.03×10^{13}	1.32
	09:52:44	3	5	2		
790717	02:12:05	7	55	3	2.82×10^{14}	1.72
	02:13:07	7	3	2		
	03:16:29	7	3	3		
	03:34:03	7	3	2		
	05:08:16	7	10	3		
	05:08:27	7	20	3		
	05:08:49	7	14	3		
	05:16:39	7	4	3		
	05:47:22	7	25	3		1.0
	06:50:39	7	5	2		
790718	11:01:39	7	6	2	4.57×10^{11}	
	11:02:31	7	5	3		
	11:05:43	7	3	1		
790719	20:23:17	7	6	2	4.37×10^{11}	
790720	02:45:16	3	7	3	2.34×10^{13}	
	14:12:34	7	10	3		
	14:24:44	7	25	3		1.0
790721	05:42:51	7	3	1	3.24×10^{10}	
790724	12:07:13	3	4	2	7.94×10^{10}	
790726	02:02:38	24	3	1	3.24×10^{10}	
790801	01:31:02	3	3	3	5.07×10^{13}	
	03:08:23	7	3	1		
	16:41:49	3	30	3		
	16:49:00	7	10	3		1.16

DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790803	07:36:23	7	2	1	9.50×10^{9}	
790806	17:51:53	3	20	3	1.10×10^{13}	
790808	10:49:31	7	3	2	3.72×10^{12}	
	10:53:09	7	3	2		
	10:53:50	7	2	2		
	11:20:53	3	10	3		
	11:39:16	7	3	2		
	14:06:44	3	12	3		
790809	03:07:03	3	3	2	3.24×10^{10}	
790819	07:29:24	7	35	3	6.03×10^{13}	
790820	13:07:58	7	12	3	3.24×10^{12}	
	22:43:14	7	9	3		
790821	03:38:15	7	2	2	1.74×10^{10}	
	06:38:08	7	2	2		
790826	01:31:47	7	267	3	3.02×10^{16}	
	21:48:24	7	8	5		
790827	05:07:25	2	75	5	3.16×10^{14}	
	02:27:48	3	6	4		
	11:03:00	3	4	4		
	13:04:46	3	3	4		
790828	07:10:41	3	5	5	1.26×10^{12}	
	07:35:49	3	7	5		
	11:50:41	3	4	4		
	17:11:17	3	5	5		
	19:46:49	3	12	4		
790829	12:24:53	3	7	3	4.37×10^{11}	
790830	01:36:55	3	10	4	1.29×10^{12}	
790831	23:06:06	3	5	4	1.55×10^{11}	
790902	04:09:49	3	12	3	2.29×10^{12}	
	22:21:08	1	3	3		
790903	03:30:30	7	5	4	1.55×10^{11}	
790904	01:47:57	1	3	3	6.60×10^{10}	
	11:33:45	1	3	3		

DATE	TIME H:M:S	STN OF MAX DURATION	DURATION (SEC)	NO. OF STN REC EVENT	LOG ENERGY PER DAY (ERGS)	$M_L \geq 1.0$
790905	12:11:44	3	5	5	4.50×10^{11}	
	14:53:34	1	2	2		
790906	06:36:22	1	7	4	5.90×10^{11}	
	22:59:42	3	5	6		
790907	07:12:36	3	15	6	4.40×10^{12}	
790908	10:34:30	1	5	4	1.54×10^{11}	
790909	20:30:26	1	6	3	3.50×10^{11}	
	23:59:59	1	4	4		
790910	09:13:39	1	4	3	7.90×10^{10}	
790912	12:20:46	3	32	7	4.57×10^{12}	1.24
790914	07:42:00	1	6	5	1.58×10^{12}	
	14:02:22	1	10	5		
790917	11:29:24	3	3	2	3.23×10^{10}	
790919	15:08:15	3	4	2	9.12×10^{13}	
	17:13:42	3	40	3		
	18:20:12	7	5	2		
	23:37:28	3	2	2		
790925	16:06:36	7	75	3	6.31×10^{14}	2.0
790928	10:08:08	24	3	1	3.24×10^{10}	
790929	03:36:50	3	3	2	2.75×10^{11}	
	05:06:06	7	5	2		
790930	06:27:06	7	4	2	5.43×10^{13}	
	06:37:34	3	3	2		
	06:58:12	7	4	3		
	15:38:23	7	33	3		1.27

APPENDIX IV

LOCATION OF EVENTS FROM

April 1, 1978 - September 30, 1979

Computer printout of HYPO71 showing data for location of events.

Column 1	Date.
Column 2	Origin time (UCT) h.m.sec.
Column 3	Latitude (N) degrees, min.
Column 4	Longitude (W) degrees, min.
Column 5	Depth (km).
Column 6	Local duration magnitude.
Column 7	No. of station readings used to locate event. P and S arrivals from same stations are regarded as 2 readings.
Column 8	Largest azimuthal separation in degrees between stations.
Column 9	Epicentral distance in km to nearest station.
Column 10	Root mean square error of time residuals in sec. RMS $=\sqrt{R_i^2/NO}$, where R_i is the time residual for the ith station.
Column 11	Standard error of the epicenter in km*.
Column 12	Standard error of the focal depth in km*.

*Statistical interpretation of standard errors involves assumptions which may not be met in earthquake locations. Therefore standard errors may not represent actual error limits.

If ERH or ERZ is blank, this means that it cannot be computed, because of insufficient data.

	DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
1	780401	1153 27.22	34-59.00	82-55.74	2.98	-0.24	10	157	1.1	0.03	0.2	0.2	B1
2	780404	911 24.08	34-58.94	82-56.51	1.88	1.18	10	166	1.5	0.06	0.3	0.5	B1
3	780408	1516 0.06	34-57.54	82-56.52	1.73	0.57	8	208	1.3	0.11	1.2	1.1	C1
4	780411	049 24.34	34-56.69	82-56.18	2.62	1.24	10	140	2.8	0.06	0.3	0.6	B1
5	780418	1116 27.22	34-56.97	82-57.64	2.44	-0.60	6	230	1.9	0.02	0.6	0.2	C1
6	780428	156 0.63	34-59.48	82-57.34	1.70	0.21	8	227	2.2	0.05	0.7	1.1	C1
7	780428	254 50.90	34-58.02	82-58.35	1.52	0.01	8	186	1.7	0.04	0.4	0.6	C1
8	780429	1513 9.07	34-57.64	82-59.31	1.66	-0.11	10	201	2.5	0.04	0.2	0.5	C1
9	780430	834 35.81	34-59.89	82-54.12	0.03	-0.40	8	270	2.8	0.08	1.4	1.5	C1
10	780430	1333 51.36	34-59.68	82-53.68	2.03	0.01	8	266	3.4	0.01	0.1	0.2	C1
11	780503	19 5 19.72	34-56.51	82-56.83	2.30	-1.22	6	256	2.7	0.01	0.4	0.4	C1
12	780509	614 46.51	34-58.32	82-59.88	1.72	-0.86	8	240	3.4	0.08	0.7	1.7	C1
13	780509	829 37.34	34-56.33	82-56.15	3.48	0.51	10	158	3.4	0.03	0.2	0.3	B1
14	780510	332 45.57	34-56.02	82-56.81	2.44	1.29	10	172	2.4	0.08	0.4	0.8	B1
15	780512	1339 0.50	34-59.82	82-58.14	1.47	1.12	7	250	3.4	0.02	0.2	0.5	C1
16	780512	1415 16.52	34-59.89	82-57.87	1.73	1.29	8	251	3.0	0.05	0.4	0.9	C1
17	780514	043 49.48	34-59.77	82-58.03	1.90	0.01	8	247	3.3	0.03	0.2	0.4	C1
18	780514	11 9 55.30	34-58.27	82-57.64	1.16	0.12	8	177	0.9	0.02	0.1	0.1	B1
19	780519	6 6 52.41	34-57.44	82-56.09	1.48	-0.24	10	116	2.0	0.04	0.2	0.5	B1
20	780520	2 4 28.25	34-55.56	82-54.42	3.38	0.01	8	213	2.2	0.03	0.3	0.4	C1
21	780522	927 49.71	34-57.41	82-56.96	0.13	-0.86	8	194	1.0	0.07	0.4	0.3	C1
22	780523	8 7 12.84	35- 0.68	82-56.61	0.78	1.18	10	293	2.3	0.04	0.4	0.3	C1
23	780523	1229 24.12	35- 0.54	82-56.31	0.72	1.32	10	291	1.9	0.07	0.5	0.4	C1
24	780523	1231 9.73	34-59.68	82-54.96	1.91	-0.40	6	324	1.4	0.07	0.5	0.3	C1
25	780605	1319 13.02	35- 1.61	82-53.72	1.95	-0.60	6	308	8.7	0.22	5.4	32.3	D1
26	780606	2223 43.51	34-58.02	82-55.93	2.29	-0.86	6	246	2.0	0.04	1.2	0.6	C1
27	780609	445 45.04	34-56.23	82-57.13	1.83	-0.40	8	183	3.1	0.03	0.2	0.7	C1
28	780609	447 49.83	34-55.77	82-57.67	1.14	-0.40	6	283	4.0	0.02	0.4	0.3	C1
29	780611	1046 6.69	34-58.59	82-57.34	1.00	-0.60	6	237	1.3	0.06	1.1	0.6	C1
30	780611	1622 0.72	34-58.04	82-54.81	2.53	1.06	8	175	3.3	0.02	0.2	0.3	B1
31	780611	1928 47.50	34-58.62	82-57.25	2.08	0.68	6	180	2.7	0.01	0.1	0.3	B1
32	780615	14 4 3.87	34-58.25	82-54.70	2.17	-0.60	6	186	3.1	0.01	0.1	0.2	C1
33	780615	1426 20.18	34-58.19	82-54.77	2.16	-0.86	6	181	3.1	0.01	0.1	0.4	C1
34	780616	2310 8.89	34-57.60	82-56.23	0.42	-1.22	6	244	1.6	0.16	1.6	10.3	D1
35	780618	12 4 51.30	34-58.16	82-59.54	1.20	-0.24	4	258	3.2	0.04			C1
36	780619	14 9 51.06	34-57.48	82-54.84	1.93	0.51	8	158	3.7	0.01	0.0	0.1	B1
37	780620	733 11.86	34-57.79	82-56.02	2.90	-0.86	8	221	1.9	0.03	0.4	0.3	C1
38	780622	8 0 20.30	34-58.28	82-55.53	3.95	-0.40	6	152	2.5	0.02	0.2	0.3	B1
39	780623	047 16.14	34-58.17	82-54.82	3.39	-0.86	8	179	3.1	0.01	0.1	0.2	B1
40	780623	212 30.77	34-59.12	82-58.09	1.57	-0.11	10	222	2.6	0.05	0.3	0.7	C1
41	780623	741 16.05	34-57.12	82-57.84	1.86	-0.24	10	139	1.7	0.03	0.1	0.3	B1
42	780624	1356 23.18	34-56.87	82-56.91	1.74	-0.40	8	212	2.0	0.04	0.4	0.5	C1
43	780624	1223 34.51	34-57.09	82-57.45	1.93	0.21	10	115	1.6	0.03	0.1	0.3	B1
44	780627	6 3 36.57	35- 0.45	82-56.30	1.19	1.18	10	290	1.7	0.05	0.5	0.3	C1
45	780627	628 47.93	35- 0.42	82-56.09	1.74	-0.24	8	308	1.6	0.04	0.6	0.5	C1
46	780630	534 59.04	34-57.79	82-58.83	0.65	-0.24	10	191	2.4	0.03	0.2	0.3	C1
47	780702	1426 1.46	34-56.24	82-56.03	1.45	0.21	10	163	3.6	0.03	0.1	0.8	B1
48	780704	445 23.83	34-59.26	82-55.76	3.62	-0.60	10	165	0.6	0.06	0.4	0.4	B1
49	780707	130 20.07	34-59.97	82-57.87	1.84	0.37	9	254	3.1	0.04	0.4	0.8	C1
50	780707	1036 0.70	34-56.00	82-57.05	3.43	0.21	10	172	2.0	0.04	0.2	0.4	B1
51	780707	20 6 55.41	34-57.57	82-58.55	1.80	-0.40	8	174	2.1	0.02	0.1	0.2	B1
52	780708	046 34.86	35- 0.18	82-55.87	1.73	-0.40	8	318	1.1	0.03	0.6	0.3	C1
53	780709	1557 40.84	34-56.32	82-56.32	2.96	0.12	10	157	3.2	0.05	0.3	0.6	B1
54	780710	23 7 29.41	34-57.80	82-55.49	2.97	-0.24	6	143	2.7	0.01	0.1	0.2	B1
55	780711	645 57.05	34-54.15	82-54.35	1.94	-0.60	8	267	3.9	0.08	0.9	2.4	C1
56	780714	237 24.55	34-56.51	82-56.67	3.60	0.12	10	144	2.7	0.06	0.3	0.5	B1
57	780716	242 43.71	34-57.62	82-55.76	2.68	0.21	10	130	2.3	0.05	0.3	0.5	B1

58	780719	1155	25.47	34-56.08	82-56.35	3.57	-0.11	10	170	3.1	0.05	0.3	0.5	B1
59	780722	1518	56.18	34-58.02	82-57.13	1.00	1.09	10	153	0.3	0.02	0.1	0.1	B1
60	780802	1721	15.44	34-57.82	82-58.57	1.11	-0.24	6	219	2.0	0.01	0.2	0.1	C1
61	780810	749	38.82	34-56.49	82-56.16	3.22	-0.24	8	149	3.5	0.02	0.1	0.3	B1
62	780815	148	23.63	34-56.59	82-56.83	1.71	-0.24	10	139	2.5	0.02	0.1	0.3	B1
63	780816	2159	16.39	35- 0.05	82-57.98	0.30	-0.24	10	258	3.3	0.06	0.4	0.7	C1
64	780817	5 8	28.48	34-58.86	82-55.91	3.31	1.70	10	140	1.3	0.04	0.3	0.3	B1
65	780818	1528	56.30	34-57.74	82-55.61	2.47	0.73	10	137	2.5	0.02	0.1	0.3	B1
66	780821	1253	12.56	34-58.09	82-56.47	2.59		8	197	1.2	0.02	0.3	0.2	C1
67	780821	1353	0.92	34-58.02	82-55.97	1.87	2.29	4	226	1.9	0.04			C1
68	780826	1711	11.79	34-56.71	82-56.23	4.28	0.29	10	139	2.7	0.05	0.3	0.5	B1
69	780826	2258	30.63	34-56.82	82-56.02	3.60	-0.24	9	135	2.8	0.06	0.3	0.8	B1
70	780827	13 0	8.24	34-57.38	82-56.19	3.21	-0.40	9	112	1.9	0.03	0.2	0.5	B1
71	780831	6 5	49.73	34-56.53	82-56.16	3.75	0.21	10	148	3.1	0.03	0.1	0.2	B1
72	780904	1225	2.33	34-56.59	82-55.89	1.97	-0.40	10	146	3.2	0.05	0.2	0.7	B1
73	780904	1517	59.84	34-56.51	82-55.88	2.69	-0.60	6	149	3.3	0.01	0.1	0.2	B1
74	780911	1155	7.57	34-56.97	82-56.36	0.23	1.32	6	126	2.2	0.15	1.2	2.3	B1
75	780916	913	48.01	34-53.90	82-52.59	5.14	1.32	6	304	4.0	0.13	2.1	1.9	C1
76	780919	335	36.46	34-58.02	82-57.34	1.97	-0.40	6	159	0.2	0.05	0.4	0.2	B1
77	780919	341	39.68	34-57.32	82-56.40	1.78	-0.60	8	140	1.7	0.05	0.2	0.5	B1
78	780921	7 7	59.51	35- 0.25	82-58.40	0.88		4	266	4.0	0.00			C1
79	780921	7 7	59.67	34-59.68	82-57.80	1.68	2.32	6	241	2.9	0.08	1.2	2.5	C1
80	780921	730	54.99	34-59.82	82-58.27	0.93	0.37	8	251	3.6	0.03	0.3	0.3	C1
81	780921	957	21.02	34-56.70	82-55.79	3.29	-0.86	6	208	3.2	0.01	0.2	0.3	C1
82	780922	2316	2.30	35- 0.00	82-53.60	3.37	1.80	12	277	3.6	0.07	0.5	0.6	C1
83	780923	220	41.34	34-59.89	82-58.28	1.67	-0.60	7	254	3.7	0.04	0.6	2.3	C1
84	780923	550	16.82	34-59.73	82-58.38	1.04	0.21	10	249	3.8	0.06	0.4	0.4	C1
85	780923	18 3	55.93	34-59.70	82-58.29	0.57	1.44	10	247	3.6	0.05	0.4	0.5	C1
86	780926	1 9	51.13	34-57.30	82-56.09	2.08	1.64	8	140	2.1	0.01	0.1	0.1	B1
87	780926	311	41.88	34-57.22	82-56.08	1.69	-0.60	8	142	2.2	0.04	0.2	0.5	B1
88	780926	727	27.96	34-57.17	82-56.04	2.08	-0.40	8	233	2.3	0.03	0.4	0.5	C1
89	780926	1918	37.85	34-56.52	82-56.10	3.50	-0.60	7	148	3.1	0.01	0.0	0.1	B1
90	780926	2010	17.29	34-57.17	82-56.09	1.69	1.84	10	119	2.2	0.03	0.1	0.4	B1
91	780927	1030	30.43	34-57.17	82-56.13	2.27	0.01	10	119	2.2	0.01	0.1	0.1	B1
92	780927	1135	43.64	34-58.79	82-57.74	1.04	-0.40	8	200	1.8	0.03	0.4	0.4	C1
93	780927	1528	5.93	34-57.28	82-56.10	1.94	-0.40	10	115	2.1	0.02	0.1	0.3	B1
94	780927	5 3	16.88	34-56.83	82-56.33	2.41	-0.86	9	132	2.4	0.03	0.2	0.3	B1
95	780928	1540	40.53	34-58.02	82-57.34	2.34	-0.24	8	159	0.2	0.11	0.2	0.2	B1
96	781003	659	33.08	34-56.43	82-56.17	3.43	1.18	7	153	3.5	0.04	0.3	0.9	B1
97	781003	8 4	49.01	34-56.61	82-55.96	3.64	-0.86	10	145	3.1	0.03	0.2	0.3	B1
98	781004	23 3	20.17	34-56.46	82-56.30	4.40	0.37	8	150	3.1	0.04	0.3	0.5	B1
99	781005	1224	55.34	34-56.57	82-57.63	2.23	1.64	7	154	1.7	0.02	0.2	0.3	B1
100	781005	1231	11.02	34-56.68	82-57.56	1.50	2.05	7	154	1.9	0.03	0.3	0.7	B1
101	781008	2259	50.19	34-58.19	82-56.13	3.03	-0.11	6	123	1.8	0.00	0.0	0.1	B1
102	781014	1459	14.16	34-59.05	82-55.98	3.19	-0.60	7	145	1.0	0.02	0.3	0.3	B1
103	781017	1142	26.21	34-56.99	82-56.29	1.92	1.06	9	125	2.2	0.02	0.1	0.2	B1
104	781020	531	59.25	34-56.42	82-56.29	3.23	0.44	11	153	3.1	0.07	0.3	0.6	B1
105	781029	1222	38.38	34-56.41	82-56.11	3.73	-0.60	8	173	3.3	0.02	0.1	0.3	B1
106	781030	1010	52.93	34-56.48	82-56.71	2.81	-0.40	6	146	2.8	0.01	0.1	0.2	B1
107	781108	931	15.92	34-56.27	82-56.27	0.72	-0.60	10	161	3.3	0.02	0.1	0.2	B1
108	781112	2041	23.78	34-56.32	82-56.12	3.06	-0.40	10	158	3.4	0.03	0.2	0.3	B1
109	781118	12 8	42.44	34-56.37	82-56.18	2.92	0.95	12	156	3.3	0.03	0.1	0.3	B1
110	781119	1619	48.88	34-57.59	82-59.08	0.32	-0.24	7	140	3.4	0.08	0.5	120.0	C1
111	781131	854	18.50	34-56.35	82-56.11	3.33	-0.86	10	157	3.4	0.02	0.1	0.2	B1
112	781131	1311	53.13	34-58.26	82-52.63	2.82	-0.40	7	253	4.2	0.09	1.0	1.7	C1
113	781205	2358	49.19	34-57.55	82-58.93	0.59	1.44	12	111	2.7	0.02	0.1	0.2	B1
114	781205	2346	41.71	34-57.53	82-58.91	0.54	-0.40	12	110	2.6	0.02	0.1	0.2	B1
115	781206	2326	53.80	34-56.35	82-56.16	3.27	0.57	11	157	3.3	0.03	0.1	0.2	B1
116	781216	8 2	9.10	34-56.33	82-56.01	2.71	0.01	8	158	3.5	0.04	0.3	0.6	B1

117	781218	4 9	43.48	34-57.02	82-57.34	4.40	1.72	10	109	1.7	0.21	1.4	1.9	B1
118	781218	459	4.09	34-57.59	82-58.73	0.86	-0.24	12	112	2.4	0.05	0.2	0.3	B1
119	781218	517	10.58	34-57.61	82-58.81	0.88	0.21	12	113	2.5	0.03	0.1	0.3	B1
120	781218	530	29.92	34-57.72	82-58.82	0.63	0.12	10	188	2.4	0.01	0.1	0.1	C1
121	781218	1046	56.55	34-57.53	82-58.68	0.49	-0.40	10	110	2.3	0.04	0.1	2.1	B1
122	781220	537	53.91	34-53.65	82-54.18	1.86	1.87	12	279	4.7	0.06	0.5	1.7	C1
123	781220	549	15.08	34-54.66	82-54.28	3.74	0.01	7	254	3.1	0.10	1.5	2.0	C1
124	781220	550	6.24	34-54.04	82-54.25	1.06	1.18	12	271	4.0	0.08	1.0	1.3	C1
125	781220	616	37.59	34-54.22	82-52.79	0.56	1.54	10	297	3.3	0.17	1.5	2.0	C1
126	781224	1545	21.32	34-56.26	82-56.06	3.22	1.02	9	162	3.6	0.02	0.1	0.2	B1
127	781226	1 9	39.24	34-56.30	82-57.35	1.85	0.37	10	221	1.7	0.07	0.6	0.8	C1
128	781229	853	56.06	34-57.98	82-55.45	0.14	-0.86	6	321	2.7	0.38	32.0	38.6	D1
129	781229	20 3	29.55	34-56.13	82-56.08	1.85	0.82	9	259	3.5	0.05	0.5	1.1	C1
130	790109	1122	46.47	34-58.70	82-57.49	0.93	0.01	6	261	1.5	0.02	0.4	0.2	C1
131	790112	1111	49.75	34-56.53	82-56.20	3.63	-0.40	8	168	3.0	0.02	0.1	0.3	B1
132	790129	1110	40.50	34-58.85	83-21.56	1.00	0.01	8	349	30.6	6.62			D1
133	790129	1159	44.18	34-56.59	82-59.09	1.98	0.37	8	177	1.8	0.04	0.3	0.6	B1
134	790130	1852	31.88	34-57.03	82-58.02	0.31	-0.24	8	157	2.0	0.33	1.44	28.7	C1
135	790213	15 7	38.04	34-58.64	82-56.36	0.26	1.72	5	188	1.9	0.02	0.2	0.3	C1
136	790213	1645	4.17	35- 0.06	82-58.07	0.33	0.01	5	220	3.4	0.09	1.71	76.4	D1
137	790301	1433	28.97	34-59.68	82-56.00	1.00	-0.40	4	294	0.2	0.22			C1
138	790303	1645	36.00	34-54.60	82-54.52	1.20	-0.11	6	304	6.3	0.06	3.9	9.0	D1
139	790312	21 8	50.71	34-55.95	82-58.45	1.00	1.54	6	177	0.2	1.20	3.7	2.6	D1
140	790320	1418	46.92	34-57.26	82-55.25	1.05	1.54	6	254	4.4	0.06	2.4	3.9	C1
141	790320	2332	5.52	34-55.95	82-56.58	1.84	-0.40	5	257	2.7	0.12	2.5	6.8	D1
142	790321	1122	51.62	34-58.40	82-55.73	0.99	0.57	6	227	2.2	0.06	2.3	3.7	C1
143	790406	2352	17.66	34-57.69	82-56.22	0.47	1.32	5	216	3.5	0.03	0.3	4.8	C1
144	790407	020	52.82	34-57.77	82-56.09	2.47	1.02	6	219	3.4	0.04	0.3	0.8	C1
145	790407	1440	34.37	34-58.08	82-56.32	2.64	1.32	5	204	2.8	0.01	0.2	0.4	C1
146	790425	223	3.07	34-56.79	82-55.70	2.34	0.57	6	250	4.4	0.02	0.3	0.4	C1
147	790427	2259	32.47	34-58.21	82-58.73	1.21	1.54	4	224	4.3	0.07			C1
148	790428	5 7	19.10	34-59.74	82-57.67	2.95	1.27	6	204	2.7	0.00	0.0	0.0	C1
149	790501	2039	59.75	34-56.23	82-58.40	1.00	2.44	3	142	0.7	0.00			C1
150	790510	2049	56.35	35- 8.33	82-58.41	2.93		5	332	16.6	0.06	2.3	14.0	D1
151	790518	052	31.94	34-54.84	82-56.33	0.57	0.01	6	297	3.6	0.25	2.3	2.2	C1
152	790528	1145	27.70	34-58.49	82-56.16	2.21	0.37	6	203	2.1	0.01	0.2	0.3	C1
153	790528	1145	37.84	34-58.25	82-56.58	1.00	2.48	3	188	2.7	0.01			C1
154	790528	1259	53.61	34-58.28	82-56.08	2.30	-0.11	6	211	2.4	0.01	0.1	0.3	C1
155	790603	1810	17.83	34-56.40	82-56.16	3.01	-0.40	6	249	3.5	0.00	0.0	0.1	C1
156	790606	2339	1.15	34-56.12	82-56.57	0.39	0.12	6	250	2.7	0.01	0.2	3.5	C1
157	790608	1559	28.48	34-56.25	82-55.75	3.12	0.57	6	262	4.0	0.01	0.1	0.2	C1
158	790609	1 8	52.53	34-57.57	82-55.36	1.05	-0.11	6	248	3.8	0.03	0.6	1.0	C1
159	790610	1438	37.96	34-56.95	82-56.64	1.00	1.02	3	219	3.3	0.04			C1
160	790611	659	35.42	34-56.45	82-56.20	2.66	0.82	6	247	3.5	0.02	0.3	0.5	C1
161	790613	950	33.76	34-56.53	82-55.98	2.81	0.51	6	250	3.8	0.03	0.3	0.5	C1
162	790615	1414	12.60	34-55.95	82-58.45	1.00	1.18	6	177	0.2	0.81	1.0	0.8	D1
163	790705	220	1.20	34-59.68	82-56.00	1.00	0.37	6	243	0.2	0.90	1.7	1.1	D1
164	790717	212	5.07	34-57.64	82-58.83	0.48	1.72	5	130	3.4	0.05	0.4	13.5	D1
165	790717	5 8	16.02	34-57.45	82-58.91	2.57	0.21	6	138	3.1	0.01	0.1	0.4	B1
166	790717	5 8	26.49	34-57.56	82-58.82	1.74	0.82	6	131	3.2	0.03	0.3	1.6	B1
167	790717	516	39.10	34-57.56	82-59.04	1.20	-0.60	6	139	3.3	0.00	0.1	0.2	B1
168	790717	547	21.89	34-57.42	82-59.12	2.49	1.02	6	147	3.1	0.03	0.3	0.7	B1
169	790718	11 2	31.29	34-57.56	82-58.78	2.88	-0.40	6	130	3.2	0.05	0.4	1.2	B1
170	790720	1412	32.96	34-55.16	82-56.77	0.56	0.21	6	289	2.7	0.30	1.7	1.5	C1
171	790720	1424	43.28	34-55.51	82-55.59	1.09	1.02	6	282	4.2	0.07	1.1	1.1	C1
172	790801	1641	48.34	34-59.94	83- 2.41	7.47	1.18	6	307	2.6	0.34	6.1	4.0	D1
173	790801	1648	59.73	34-57.42	82-59.12	1.53	0.21	6	147	3.1	0.02	0.2	1.2	B1

174	790806	1751	53.06	34-58.39	82-57.31	1.10	0.82	6	154	3.1	0.01	0.3	0.8	B1
175	790808	1120	52.20	34-57.34	82-54.87	2.01	0.21	6	263	4.4	0.04	0.5	1.3	C1
176	790808	14 6	43.09	34-57.55	82-55.25	2.89	0.37	6	251	3.9	0.00	0.0	0.1	C1
177	790819	729	23.71	34-57.36	82-59.02	1.90	1.32	6	145	3.0	0.02	0.2	0.9	B1
178	790820	2243	13.89	34-57.59	82-59.00	1.35		6	137	3.4	0.01	0.1	1.4	B1
179	790826	131	46.68	34-56.83	82-56.77	1.00	3.11	3	219	3.0	0.01			C1
180	790826	145	11.41	34-56.56	82-56.38	2.39	0.21	6	239	3.3	0.01	0.1	0.2	C1
181	790827	5 7	23.81	34-55.95	82-56.15	1.74	2.00	9	178	3.3	0.08	0.6	3.0	C1
182	790827	13 4	44.99	34-56.38	82-55.83	4.38	-0.86	7	156	4.0	0.09	0.8	1.5	B1
183	790828	710	40.37	34-56.43	82-56.22	3.82	-0.40	6	172	3.2	0.01	0.2	0.3	B1
184	790828	735	48.74	34-56.11	82-56.34	1.98	-0.11	8	185	3.6	0.04	0.3	1.2	C1
185	790828	1150	40.01	34-56.50	82-56.06	3.47	-0.60	6	169	3.2	0.01	0.2	0.2	B1
186	790828	1711	16.32	34-56.17	82-56.20	1.76	-0.40	8	182	3.6	0.03	0.2	0.8	C1
187	790828	1946	47.83	34-55.84	82-56.11	2.93	0.37	8	195	4.6	0.05	0.5	1.1	C1
188	790829	1224	51.59	34-56.30	82-55.70	1.84	-0.11	6	261	4.1	0.03	0.4	1.1	C1
189	790830	136	55.03	34-56.42	82-55.82	1.81	0.21	8	196	3.5	0.07	0.4	1.2	C1
190	790831	23 6	5.87	34-56.88	82-56.11	3.53	-0.40	6	155	2.6	0.01	0.1	0.2	B1
191	790902	4 9	47.53	34-56.37	82-55.98	0.84	0.37	8	199	3.5	0.09	0.4	0.7	C1
192	790903	330	29.98	34-57.13	82-56.39	1.91	-0.40	8	154	1.9	0.06	0.6	1.1	B1
193	790904	147	51.29	34-56.08	82-56.47	2.87	-0.86	6	187	3.6	0.02	0.3	0.6	C1
194	790904	1133	43.67	34-54.00	82-56.48	3.84	-0.86	6	255	6.4	0.13	2.0	4.6	C1
195	790905	1043	17.67	34-57.39	82-58.95	0.74	0.51	10	178	2.5	0.10	0.8	1.1	B1
196	790905	1211	43.60	34-56.13	82-56.36	1.78	-0.40	9	168	3.1	0.11	0.6	3.3	C1
197	790906	636	21.23	34-56.54	82-56.20	3.27	-0.11	6	168	3.0	0.01	0.1	0.1	B1
198	790906	2259	41.68	34-56.22	82-56.32	3.23	-0.40	8	181	2.2	0.02	0.2	0.3	C1
199	790907	712	35.66	34-56.26	82-57.64	0.26	0.57	12	183	3.1	0.08	0.4	0.6	C1
200	790908	1034	29.39	34-56.73	82-56.12	4.38	-0.40	8	160	2.0	0.09	1.2	1.1	C1
201	790909	2030	5.19	34-56.56	82-56.07	3.70	-0.24	6	167	3.1	0.01	0.1	0.2	B1
202	790909	2359	57.84	34-57.24	82-55.73	3.78	-0.60	8	181	2.6	0.09	0.9	1.1	C1
203	790910	913	37.91	34-56.90	82-55.89	4.16	-0.60	8	159	2.8	0.04	0.4	0.5	B1
204	790912	1220	44.92	34-56.04	82-57.62	0.60	1.24	11	192	3.5	0.11	0.5	7.5	D1
205	790914	741	59.32	34-56.73	82-56.02	3.71	-0.24	8	147	2.9	0.01	0.1	0.1	B1
206	790914	14 2	21.42	34-56.51	82-56.04	3.45	0.21	8	149	3.2	0.02	0.1	0.2	B1
207	790925	16 6	36.25	34-56.79	82-56.64	1.00	1.80	3	224	3.1	0.02			C1
208	790930	1538	23.44	34-56.22	82-57.24	1.96	1.18	6	230	1.8	0.02	0.3	0.4	C1

APPENDIX V

LOCATIONS OF SEISMIC STATIONS AT MONTICELLO RESERVOIR

STN	LAT.	LONG.	ELEV.	RX TYPE	DATES OCCUPIED
001	34°19.91'N	81°17.74'W	435'	CBGN	11/30/77
002	34°11.58'N	81°13.81'W	275'	SB	11/30/77
003	34°21.09'N	81°27.41'W	410'	CBGN	11/30/77
004	34°25.72'N	81°12.99'W	400'	GF	11/30/77
PAR; 005	34°16.05'N	81°20.05'W	490'	CBGN	02/07/78 -
006	34°21.03'N	81°11.23'W	440'	GD	06/06/78 -
007	34°22.23'N	81°19.50'W	430'	GD	03/24/78 -
008	34°24.56'N	81°24.55'W	380'	CBGN	06/06/78 -
009	34°18.03'N	81°24.18'W	395'	GF	06/06/78 -
010	34°20.17'N	81°20.37'W	450'	MG	06/06/78
JSC	34°16.80'N	81°15.60'W	380'	MG	10/01/73
OIS	34°19.90'N	81°17.78'W	435'	GD	02/07/78 - 03/23/78
RAD	34°17.33'N	81°18.28'W	470'	MG	02/07/78 - 03/23/78

CBGN - Charlotte Belt Gneiss

GF - Granofels

MG - Migmatite

SB - Slate Belt

GD - Granodiorite

APPENDIX VI

MONTICELLO RESERVOIR
VELOCITY MODEL

Velocity km/sec	Depth km
1.00	0.00
5.40	0.03
5.90	0.18
6.10	0.46
6.30	0.82
8.10	30.00

APPENDIX VII

	DATE	ORIGIN	LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
1	780404	443 10.98	34-17.19	81-19.04	0.92	1.02	11	83	2.6	0.06	0.2	1.5	A1
2	780406	1515 5.87	34-23.09	81-18.59	3.16	0.82	8	166	6.0	0.07	0.6	1.1	B1
3	780407	525 51.66	34-19.88	81-21.17	1.86	0.78	10	140	5.3	0.05	0.2	1.1	B1
4	780408	055 6.75	34-18.35	81-18.14	0.16	1.02	8	138	2.9	0.03	0.1	0.3	B1
5	780408	6 0 8.25	34-23.33	81-18.76	0.59	0.01	6	326	6.5	0.01	0.1	10.5	D1
6	780409	955 15.49	34-17.56	81-19.64	1.93		13	107	2.9	0.06	0.3	0.6	B1
7	780409	1046 28.86	34-20.30	81-19.90	0.13	1.18	14	129	1.8	0.10	0.2	0.4	B1
8	780410	147 32.60	34-19.32	81-19.80	0.80	0.82	16	116	1.1	0.08	0.2	0.6	B1
9	780412	137 36.94	34-19.90	81-18.76	0.24	0.99	13	120	1.6	0.08	0.2	0.5	B1
10	780412	658 48.90	34-20.60	81-20.63	2.48	0.51	12	136	4.6	0.08	0.3	1.0	B1
11	780412	952 19.83	34-20.39	81-19.80	0.10	0.73	14	130	3.3	0.05	0.1	0.3	B1
12	780412	2122 24.64	34-19.81	81-20.87	0.16	0.82	11	139	4.8	0.07	0.4	1.1	B1
13	780413	7 6 24.08	34-17.99	81-20.23	1.80	0.68	12	222	3.6	0.11	0.7	1.3	C1
14	780413	1418 19.39	34-20.37	81-20.20	4.49		5	131	9.7	0.07	1.0	4.5	C1
15	780414	2233 35.40	34-19.63	81-20.11	3.06	0.82	14	120	3.7	0.11	0.4	0.8	B1
16	780415	1526 33.85	34-21.38	81-20.04	1.77	1.37	6	220	4.5	0.08	1.5	4.5	C1
17	780416	754 35.94	34-20.62	81-20.25	1.83	0.82	10	135	4.1	0.06	0.3	1.0	B1
18	780417	12 6 16.95	34-17.41	81-19.06	1.48	1.18	11	87	2.9	0.08	0.2	0.8	A1
19	780418	458 43.07	34-20.35	81-19.81	3.25	1.18	6	130	3.3	0.05	0.4	1.0	B1
20	780418	1630 44.71	34-21.02	81-20.11	3.90	0.51	13	141	4.2	0.40	1.5	3.1	C1
21	780418	1639 49.52	34-20.52	81-20.36	1.81	1.02	14	134	4.2	0.06	0.2	0.7	B1
22	780419	728 20.00	34-17.39	81-17.46	0.13	0.51	13	87	3.1	0.05	0.1	0.5	A1
23	780419	1325 16.99	34-18.52	81-19.60	2.38		9	146	3.8	0.06	0.3	0.7	B1
24	780419	1327 6.27	34-18.36	81-19.54	0.07	1.24	10	104	4.0	0.07	0.3	0.6	B1
25	780420	16 8 0.07	34-17.87	81-20.21	1.32	0.57	9	123	3.4	0.06	0.4	1.5	B1
26	780420	2353 40.13	34-18.34	81-20.33	3.09	1.93	10	121	4.3	0.04	0.2	0.4	B1
27	780421	336 45.67	34-18.41	81-19.72	1.85	0.99	13	106	4.1	0.05	0.2	0.5	B1
28	780422	122 21.46	34-23.12	81-18.61	1.81		10	166	6.1	0.09	0.4	2.5	C1
29	780422	136 24.59	34-20.08	81-18.16	1.00	2.64	3	275	0.7	0.00			C1
30	780422	136 23.99	34-22.29	81-18.59	1.92	2.64	5	255	4.6	0.07	2.8	3.7	D1
31	780422	136 8.36	34-22.49	81-18.98	1.99	0.57	12	158	5.1	0.30	1.2	5.1	C1
32	780422	1141 35.84	34-23.27	81-19.82	0.46	0.82	10	176	7.0	0.22	1.0	3.7	C1
33	780423	1546 20.95	34-23.36	81-19.48	1.97	0.82	10	243	6.9	0.06	0.5	1.6	C1
34	780424	2 1 2.50	34-20.41	81-20.33	2.72		11	132	4.1	0.12	0.5	1.3	B1
35	780423	821 44.60	34-18.11	81-20.00	1.86		11	115	3.8	0.07	0.3	0.9	B1
36	780426	828 42.64	34-18.23	81-20.07	1.94		12	153	4.7	0.14	0.5	2.3	C1
37	780426	833 52.01	34-18.45	81-19.90	3.13	0.82	12	149	4.3	0.07	0.3	0.7	B1
38	780426	17 2 59.81	34-20.05	81-20.27	0.10		10	103	3.9	0.14	0.8	2.2	B1
39	780426	1748 19.56	34-18.10	81-20.06	0.23		10	116	3.8	0.07	0.2	0.6	B1
40	780427	1328 34.75	34-20.60	81-20.63	3.99		8	143	4.6	0.02	0.1	0.3	B1
41	780428	452 33.45	34-21.46	81-20.20	0.27	1.18	14	131	1.8	0.07	0.2	0.5	B1
42	780428	511 3.90	34-20.01	81-21.06	1.88	0.57	11	222	4.7	0.15	0.9	2.6	C1
43	780429	629 34.98	34-18.44	81-20.30	0.03	0.73	12	195	4.4	0.09	0.3	0.4	C1
44	780429	1844 51.86	34-21.55	81-20.25	0.27		12	137	1.7	0.12	0.2	0.5	B1
45	780502	17 7 56.73	34-20.60	81-14.24	0.58		7	247	5.5	0.05	0.5	75.1	D1
46	780503	123 55.53	34-23.31	81-18.70	0.91	0.91	12	170	2.3	0.08	0.4	1.3	B1
47	780503	5 9 20.81	34-21.88	81-20.38	1.23	0.82	12	156	1.5	0.10	0.4	0.8	B1
48	780503	11 7 33.78	34-20.01	81-19.22	0.07	0.82	9	202	2.3	0.06	0.4	0.6	C1
49	780508	1047 4.10	34-22.90	81-18.70	3.41		12	163	1.7	0.09	0.4	0.5	B1
50	780508	1422 56.06	34-20.01	81-20.05	0.06		8	257	3.6	0.07	0.6	0.8	C1
51	780508	17 0 28.96	34- 5.95	81- 7.70	3.65		7	330	14.0	0.08	2.8	7.9	D1
52	780509	2320 24.22	34-20.41	81-20.19	1.99		10	143	3.5	0.07	0.3	0.8	B1
53	780510	1331 50.17	34-20.13	81-19.59	1.08		12	93	2.9	0.08	0.3	2.1	B1
54	780510	1517 35.52	34-20.07	81-19.55	0.06		13	93	2.8	0.09	0.3	0.6	B1
55	780512	1640 3.57	34-18.41	81-17.49	0.09	1.18	12	109	2.8	0.06	0.2	0.5	B1
56	780513	1123 20.85	34-20.20	81-19.59	0.16	0.91	8	254	2.9	0.04	0.3	0.4	C1
57	780514	8 0 0.06	34-24.15	81-17.82	3.94	1.64	8	180	7.8	0.04	0.2	0.6	B1

58	780514	934	24.34	34-23.11	81-18.16	1.91		8	163	6.0	0.07	0.4	1.9	B1
59	780514	937	5.35	34-23.65	81-18.34	5.49	0.87	8	174	9.0	0.05	0.3	1.0	B1
60	780514	956	7.31	34-18.05	81-19.40	0.00	0.91	9	150	4.3	0.06	0.2	0.5	B1
61	780514	956	46.60	34-23.27	81-18.12	4.97	1.46	10	166	6.2	0.02	0.1	0.2	B1
62	780514	1046	15.44	34-23.30	81-17.84	5.33	0.82	10	165	6.3	0.08	0.4	0.7	B1
63	780515	951	29.64	34-20.30	81-18.69	1.86	0.82	9	125	1.6	0.09	0.5	1.2	B1
64	780517	312	8.04	34-20.57	81-19.02	0.53	0.21	14	84	2.3	0.08	0.3	15.7	B1
65	780517	423	2.06	34-20.53	81-19.00	0.47	0.21	14	84	2.3	0.09	0.3	1.2	A1
66	780517	947	9.04	34-20.14	81-19.18	0.22	1.02	14	88	2.2	0.09	0.2	0.5	A1
67	780517	1041	20.84	34-20.01	81-19.40	0.09	0.44	12	170	2.6	0.07	0.3	0.6	B1
68	780517	1417	1.20	34-20.60	81-19.60	0.56	0.82	12	90	3.0	0.08	0.4	10.1	B1
69	780517	2220	8.32	34-20.67	81-18.98	0.42	0.82	13	83	2.4	0.09	0.3	0.8	A1
70	780517	2234	13.05	34-20.55	81-18.78	1.96	1.21	12	84	2.0	0.10	0.4	1.0	A1
71	780519	719	51.57	34-20.88	81-19.09	0.01	0.51	8	135	2.7	0.12	0.1	0.4	B1
72	780519	1349	11.65	34-20.24	81-19.05	0.22	0.99	6	126	2.1	0.03	0.3	0.6	B1
73	780519	2342	4.64	34-20.19	81-19.16	0.97	0.63	13	87	2.2	0.07	0.2	1.6	A1
74	780520	819	4.22	34-23.33	81-18.71	0.20	0.68	14	171	2.4	0.10	0.3	0.6	B1
75	780520	9 8	25.52	34-20.35	81-18.89	2.84		13	83	1.9	0.08	0.3	0.6	A1
76	780520	1934	0.97	34-17.53	81-20.14	0.74	0.95	14	124	2.7	0.10	0.3	2.9	B1
77	780521	4 2	0.26	34-20.01	81-19.13	0.65		11	88	2.1	0.08	0.3	4.2	B1
78	780521	518	2.84	34-19.90	81-19.43	0.60	0.51	11	171	2.6	0.04	0.2	3.3	C1
79	780521	1448	13.23	34-17.41	81-18.74	1.59	0.82	12	134	3.2	0.08	0.3	1.0	B1
80	780522	059	23.76	34-19.87	81-18.77	1.75	0.57	13	84	1.6	0.10	0.3	1.1	A1
81	780522	2353	27.84	34-20.61	81-19.15	1.00	0.57	10	161	2.5	0.08	0.5	2.1	C1
82	780523	417	49.13	34-20.53	81-18.91	0.58	1.80	9	83	2.1	0.05	0.3	4.5	B1
83	780524	138	35.86	34-20.50	81-19.24	1.07	0.51	14	86	2.5	0.06	0.2	0.8	A1
84	780525	2 3	19.03	34-20.30	81-19.37	1.00	0.82	11	89	2.6	0.20	0.7	4.9	B1
85	780525	643	20.03	34-25.82	81-13.09	7.24	1.18	8	253	0.2	2.27	17.0	16.2	D1
86	780525	648	18.44	34-18.70	81-20.05	1.97	1.54	8	147	4.2	0.14	1.0	3.9	C1
87	780525	16 8	3.22	34-25.25	81-23.60	2.69	0.82	11	230	8.4	0.10	0.6	1.9	C1
88	780525	19 2	10.12	34-20.31	81-19.00	0.98	1.12	13	85	2.1	0.08	0.3	1.7	A1
89	780528	1 7	14.88	34-20.25	81-19.78	0.34	1.02	14	95	3.2	0.08	0.2	1.0	B1
90	780528	3 0	36.69	34-22.97	81-18.00	0.11	1.06	13	160	2.7	0.08	0.2	0.7	B1
91	780528	810	24.90	34-16.92	81-21.66	0.04	0.73	10	256	3.0	0.16	1.8	3.1	C1
92	780528	1717	51.54	34-18.18	81-20.35	0.39		12	197	4.0	0.10	0.5	1.6	C1
93	780529	2312	51.88	34-18.13	81-21.36	1.88		8	266	6.5	0.20	2.8	7.9	D1
94	780530	031	47.94	34-17.83	81-20.14	0.09		8	121	3.3	0.07	0.4	1.2	B1
95	780530	445	7.03	34-17.69	81-20.14	1.15		10	219	3.0	0.12	0.8	2.6	C1
96	780530	857	12.69	34-18.05	81-18.86	1.00		11	94	3.8	0.30	1.2	7.0	C1
97	780530	10 3	13.66	34-20.48	81-19.07	1.92		9	129	2.3	0.09	0.4	1.5	B1
98	780531	531	32.38	34-18.47	81-16.75	1.68		8	127	3.1	0.32	2.0	3.8	C1
99	780531	2339	50.19	34-20.70	81-31.52	0.36		11	310	6.4	6.38	339.87	95.4	D1
100	780601	1010	44.83	34-18.32	81-17.62	0.17	1.44	4	202	2.9	0.04			C1
101	780602	134	55.54	34-20.82	81-18.95	1.00	0.21	8	133	2.5	0.09	0.5	3.1	B1
102	780602	250	10.56	34-18.23	81-19.36	1.83	1.69	6	148	4.0	0.08	0.6	3.3	C1
103	780602	1326	59.89	34-21.38	81-20.49	1.97	0.44	10	148	5.0	0.10	0.4	1.8	B1
104	780603	037	9.55	34-18.38	81-18.99	1.79	1.18	6	246	3.4	0.03	0.7	1.1	C1
105	780603	349	10.58	34-18.26	81-19.65	1.92	1.18	8	150	4.2	0.04	0.2	0.8	B1
106	780603	411	27.20	34-20.36	81-20.63	0.40	1.54	7	132	4.5	0.03	0.2	1.1	B1
107	780603	442	5.33	34-19.66	81-18.52	1.64	1.12	9	127	1.3	0.08	0.5	1.0	B1
108	780603	1113	20.93	34-20.16	81-20.38	1.86	1.12	9	131	4.1	0.01	0.1	0.4	B1
109	780603	1844	15.14	34-18.34	81-19.77	1.93	0.95	6	179	4.3	0.07	0.8	3.1	C1

110	780603	2336	34.73	34-19.69	81-18.66	0.66	1.18	7	127	1.5	0.02	0.1	0.6	B1
111	780604	024	37.12	34-18.23	81-19.44	3.66	1.02	7	148	6.5	0.04	0.3	1.5	B1
112	780604	1726	22.69	34-18.19	81-19.53	0.21	1.18	10	150	4.2	0.05	0.2	0.9	B1
113	780604	1755	24.85	34-18.33	81-19.56	0.14	1.24	10	148	4.0	0.05	0.2	0.4	B1
114	780604	18 0	34.79	34-18.35	81-19.39	1.80	1.18	10	147	3.8	0.09	0.4	1.9	B1
115	780604	18 5	49.06	34-18.14	81-19.18	3.53	1.24	5	148	4.0	0.06	0.9	2.0	C1
116	780605	2039	10.26	34-19.69	81-18.55	1.96	1.21	7	127	1.3	0.06	0.4	0.8	B1
117	780605	2112	19.29	34-19.65	81-18.43	0.07	0.68	9	126	1.2	0.09	0.4	1.0	B1
118	780605	2148	57.18	34-19.72	81-18.50	0.28	1.24	8	126	1.2	0.07	0.2	0.4	B1
119	780605	2340	38.03	34-20.88	81-18.48	1.00	0.99	9	132	2.1	0.09	0.4	2.4	B1
120	780606	1 5	24.66	34-19.52	81-12.80	7.55	0.82	5	187	11.5	0.10	0.4	0.7	C1
121	780614	2140	15.28	34-11.68	81-13.91	1.00	1.44	5	169	0.2	0.09	1.3	1.6	C1
122	780606	1541	28.64	34-19.64	81-18.72	0.03	0.78	8	128	1.6	0.07	0.2	0.6	B1
123	780608	218	41.43	34-18.54	81-19.43	1.77	0.99	8	145	3.6	0.08	0.4	1.3	B1
124	780608	415	20.94	34-19.81	81-18.39	2.36	0.82	7	125	1.0	0.10	0.7	0.8	B1
125	780608	2110	59.52	34-20.01	81-19.44	0.19	0.63	6	252	2.6	0.09	1.0	1.1	C1
126	780609	1319	58.66	34-22.95	81-17.84	0.40	1.18	7	159	5.6	0.10	0.5	2.0	C1
127	780610	4 0	30.63	34-18.62	81-19.53	2.59	0.63	10	145	3.6	0.08	0.3	0.9	B1
128	780611	245	48.64	34-20.79	81-18.95	0.13	0.87	7	133	2.5	0.08	0.4	1.1	B1
129	780611	438	49.82	34-20.61	81-18.72	1.64	1.62	8	129	2.0	0.05	0.3	0.9	B1
130	780611	814	15.33	34-20.69	81-19.37	1.00	0.29	9	133	2.9	0.09	0.4	3.6	B1
131	780612	042	37.46	34-20.60	81-18.94	0.17	0.21	10	130	2.2	0.09	0.3	0.7	B1
132	780612	10 7	30.77	34-19.78	81-18.27	1.93	0.95	9	124	0.8	0.08	0.3	0.9	B1
133	780613	412	22.92	34-19.81	81-19.64	0.07	0.87	9	132	2.9	0.06	0.2	0.4	B1
134	780613	429	17.30	34-20.52	81-18.83	1.00	0.99	9	128	2.0	0.10	0.4	2.7	B1
135	780614	1638	40.00	34-18.15	81-19.17	0.26	1.06	7	147	3.9	0.06	0.5	2.2	C1
136	780615	141	27.80	34-19.62	81-18.88	0.22	0.57	7	246	1.8	0.10	1.4	1.2	C1
137	780615	210	31.97	34-19.85	81-18.70	0.98	0.82	6	126	1.5	0.01	0.1	0.3	B1
138	780615	7 9	14.30	34-16.99	81-18.21	4.96	0.57	6	152	4.0	0.03	0.3	0.4	B1
139	780615	710	52.30	34-19.28	81-18.40	3.05	0.63	5	130	1.5	0.01	0.1	0.2	C1
140	780616	210	51.24	34-21.44	81-20.51	4.82	1.02	9	149	5.1	0.06	0.3	1.0	B1
141	780616	943	54.39	34-18.53	81-19.95	0.96	1.83	7	149	4.2	0.06	0.4	5.7	C1
142	780616	1251	5.79	34-20.24	81-20.10	0.95	1.09	8	129	3.7	0.09	0.5	5.8	C1
143	780617	132	4.87	34-19.54	81-19.55	3.33	1.18	8	134	7.9	0.06	0.3	1.2	B1
144	780617	410	51.65	34-19.85	81-19.41	0.71	2.05	6	130	2.6	0.03	0.3	3.3	B1
145	780617	858	25.93	34-17.14	81-18.77	1.81	1.02	10	155	4.9	0.09	0.4	1.6	B1
146	780617	942	45.67	34-20.01	81-19.52	0.22	0.57	9	129	2.7	0.07	0.2	0.6	B1
147	780618	1523	2.39	34-19.53	81-18.11	1.00	1.32	8	126	0.9	0.09	0.4	1.2	B1
148	780618	1523	49.87	34-19.86	81-18.71	0.15	1.02	7	126	1.5	0.02	0.1	0.3	B1
149	780619	529	29.07	34-17.28	81-19.17	1.86	0.87	8	157	5.3	0.04	0.2	1.5	B1
150	780619	9 1	35.54	34-20.13	81-19.93	1.69	0.21	9	130	3.4	0.06	0.3	1.7	B1
151	780619	1034	29.46	34-19.84	81-18.01	0.11	0.57	9	122	0.4	0.09	0.3	0.8	B1
152	780620	728	57.64	34-20.72	81-19.15	1.63	0.57	9	133	2.6	0.10	0.4	2.2	B1
153	780620	924	50.64	34-19.86	81-18.84	1.00	0.21	7	246	1.7	0.10	1.6	2.6	C1
154	780620	1944	23.14	34-17.79	81- 6.93	0.36	0.87	7	255	13.4	0.03	0.5	1.1	C1
155	780621	243	56.36	34-18.37	81-19.61	2.00	1.46	8	148	4.0	0.07	0.4	1.7	B1
156	780621	246	40.62	34-18.89	81-20.13	1.82	0.82	10	146	4.1	0.09	0.4	1.5	B1
157	780622	1036	46.58	34-20.52	81-19.50	0.05	0.44	6	131	2.9	0.07	0.4	0.9	B1
158	780622	1218	27.43	34-19.64	81-17.84	1.00	0.82	7	124	0.5	0.10	0.6	1.2	B1
159	780622	1914	6.29	34-27.17	81-17.37	7.57	-0.24	5	238	7.2	0.08	1.9	1.9	C1
160	780625	8 0	11.08	34-18.15	81-17.84	1.40	0.21	9	137	3.3	0.03	0.2	0.5	B1
161	780625	921	57.29	34-19.76	81-18.03	1.22	0.21	5	238	0.5	0.02	0.9	0.2	C1
162	780625	1722	20.67	34-22.15	81-16.33	1.80	0.82	9	134	4.7	0.09	0.5	1.7	B1
163	780626	619	33.62	34-16.92	81-17.86	6.02	0.57	6	273	5.5	0.03	0.6	0.4	C1
164	780626	1111	11.72	34-19.62	81-18.44	0.01	1.44	7	127	1.2	0.05	0.2	0.7	B1
165	780626	1232	10.36	34-20.59	81-18.84	0.20	0.82	7	129	2.1	0.04	0.3	0.7	B1
166	780627	357	51.50	34-22.25	81-20.49	7.29	0.21	5	162	6.0	0.05	1.0	1.8	C1
167	780627	359	21.46	34-22.08	81-20.74	5.95	0.57	5	161	6.1	0.00	0.1	0.1	C1
168	780627	447	8.38	34-19.52	81-13.84	1.95	0.95	6	173	5.7	0.08	0.9	4.8	C1

169	780628	1248	33.27	34-22.79	81-17.84	1.82	1.06	8	156	5.3	0.08	0.4	1.7	B1
170	780628	1313	2.25	34-22.89	81-17.80	6.59	0.21	5	157	5.5	0.01	0.1	0.2	C1
171	780628	1318	53.06	34-27.45	81-21.55	2.07	-0.40	5	246	13.5	0.08	2.5	11.4	D1
172	780628	1612	32.49	34-18.73	81-18.99	1.93	0.82	7	140	2.9	0.10	0.6	2.5	C1
173	780629	16 5	51.97	34- 5.46	81- 5.31	0.03	1.27	7	328	17.3	0.09	10.6	25.7	D1
174	780629	1827	46.06	34-25.32	81-23.84	3.77	1.18	8	233	9.5	0.10	0.8	2.4	C1
175	780630	1032	2.44	34-18.74	81-19.62	1.58	0.82	7	144	3.6	0.08	0.4	2.5	C1
176	780630	1959	2.31	34-20.26	81-19.20	1.80	0.21	5	171	2.3	0.00	0.1	0.2	C1
177	780701	313	48.20	34-20.01	81-20.39	1.92	-0.40	6	188	4.1	0.04	0.7	1.7	C1
178	780701	12 4	57.87	34-20.01	81-17.84	1.00	0.63	5	237	0.2	0.07	1.7	1.1	C1
179	780703	1423	16.50	34-20.01	81-18.47	0.40	0.63	6	123	1.1	0.07	0.6	1.1	B1
180	780703	2047	8.84	34-17.41	81- 5.84	0.47	1.50	7	264	16.3	0.07	1.3	3.1	C1
181	780704	9 8	20.37	34-19.68	81-18.45	0.17	0.63	7	126	1.2	0.03	0.1	0.2	B1
182	780704	1557	42.98	34-18.36	81-19.44	1.76	1.27	8	147	3.9	0.06	0.3	1.9	B1
183	780704	1924	35.36	34-19.55	81-18.54	0.00	0.82	8	128	1.4	0.06	0.1	0.4	B1
184	780704	1948	20.69	34-19.42	81-18.20	1.00	1.44	7	127	1.1	0.07	0.5	1.2	B1
185	780705	011	41.13	34-19.38	81-18.64	1.00	1.06	9	130	1.7	0.09	0.4	1.8	B1
186	780705	855	3.10	34-18.71	81-19.74	1.82	0.82	8	145	3.8	0.07	0.3	1.5	B1
187	780706	4 3	34.08	34-20.26	81-19.77	3.36	0.95	9	128	3.2	0.07	0.3	1.2	B1
188	780706	2353	29.89	34-22.99	81-18.95	0.44	1.02	8	166	6.0	0.10	0.5	2.0	C1
189	780707	011	30.47	34-23.52	81-19.01	3.35	0.82	8	176	7.0	0.04	0.2	0.7	B1
190	780707	2012	59.92	34-19.80	81-19.14	1.07	0.73	9	127	1.0	0.05	0.3	0.7	B1
191	780708	015	48.32	34-19.76	81-18.50	1.00	0.29	3	323	1.8	0.04			C1
192	780708	544	38.53	34-23.19	81-18.99	1.78	-0.24	8	330	4.3	0.03	0.6	1.2	C1
193	780708	10 8	23.13	34-22.91	81-18.39	1.84	-0.11	8	329	4.3	0.02	0.4	0.8	C1
194	780708	1340	10.23	34-20.49	81-18.90	1.00	0.37	4	306	1.1	0.01			C1
195	780708	2228	3.35	34-20.31	81-20.05	0.62	0.57	8	154	0.8	0.01	0.1	0.2	B1
196	780709	422	59.58	34-20.35	81-19.37	1.00	-0.24	5	277	0.3	0.04	1.7	0.9	C1
197	780709	11 2	17.16	34-20.49	81-20.43	0.06	-0.40	5	121	1.2	0.01	0.1	3.4	C1
198	780709	1955	57.09	34-19.84	81-18.63	1.24	0.63	17	122	1.4	0.06	0.2	0.4	B1
199	780710	423	42.27	34-19.63	81-18.21	0.58	-0.24	7	328	2.3	0.04	0.6	4.6	C1
200	780710	1128	59.04	34-17.77	81-20.62	0.31	1.18	15	163	4.3	0.09	0.4	1.6	B1
201	780710	1137	28.18	34-18.04	81-20.13	1.97	1.18	12	156	5.0	0.09	0.4	1.4	B1
202	780710	1142	5.50	34-18.16	81-20.16	1.92	1.34	14	155	3.7	0.07	0.4	1.1	B1
203	780710	1151	17.53	34-17.94	81-20.44	1.73	0.82	15	159	4.0	0.08	0.3	1.2	B1
204	780710	1152	14.73	34-17.95	81-20.22	2.61	1.02	12	158	4.4	0.08	0.3	1.0	B1
205	780710	1152	40.59	34-17.96	81-20.19	2.85	0.82	14	157	4.3	0.06	0.2	0.7	B1
206	780710	1153	8.44	34-18.17	81-20.52	5.47	1.18	11	157	4.1	0.24	1.1	1.9	C1
207	780710	1155	3.97	34-17.77	81-20.31	3.75	0.82	9	161	5.6	0.03	0.1	0.4	B1
208	780710	1155	50.65	34-17.99	81-20.42	4.33	0.68	11	159	5.4	0.06	0.3	0.6	B1
209	780710	1326	27.76	34-18.74	81-19.50	1.90	0.82	9	143	3.5	0.10	0.5	1.4	B1
210	780710	14 2	53.95	34-17.73	81-20.43	4.63	1.27	7	162	7.6	0.05	0.3	1.6	B1
211	780711	1142	47.78	34-20.43	81-19.64	1.13	0.21	6	186	0.4	0.01	0.1	0.2	C1
212	780711	1144	26.02	34-20.35	81-19.64	0.21	0.44	12	115	0.2	0.08	0.3	0.4	B1
213	780711	1545	39.06	34-21.18	81-20.21	1.00	-0.11	6	235	0.2	1.30	18.6	26.9	D1
214	780711	1613	37.85	34-20.44	81-19.98	0.24	0.63	7	141	3.6	0.06	0.1	0.3	B1
215	780712	020	37.20	34-20.21	81-19.64	0.19	0.82	15	112	0.2	0.09	0.2	0.4	B1
216	780712	1158	24.89	34-22.76	81-18.68	1.87	0.78	16	161	3.8	0.09	0.3	1.0	B1
217	780713	021	16.53	34-22.67	81-18.47	0.07	1.45	18	158	3.9	0.07	0.2	0.4	B1
218	780713	1155	46.90	34-23.06	81-17.89	2.00	0.01	8	327	5.0	0.04	1.1	2.6	C1
219	780713	1246	48.74	34-20.08	81-19.02	1.62	0.73	15	116	0.9	0.15	0.5	0.9	B1
220	780713	16 5	22.65	34-25.41	81-23.53	1.96	1.18	8	231	10.0	0.09	0.7	4.4	C1
221	780713	20 0	49.82	34-17.69	81-18.34	3.39	0.82	8	146	4.2	0.06	0.3	0.7	B1
222	780714	335	40.96	34-20.04	81-19.36	1.00	0.92	19	109	0.5	0.09	0.3	0.7	B1
223	780714	1158	47.95	34-19.47	81-20.73	0.48	0.21	5	297	2.3	0.09	0.5	1.4	C1
224	780714	1928	18.42	34-20.76	81-20.07	1.91	0.82	7	137	3.9	0.07	0.4	2.4	C1
225	780714	1931	20.73	34-20.71	81-20.11	1.71	0.44	8	136	3.9	0.09	0.5	1.7	B1
226	780714	1955	25.19	34-20.65	81-20.35	1.85	0.95	8	136	4.2	0.08	0.4	1.5	B1
227	780715	614	31.00	34-20.78	81-20.20	1.69	0.63	8	138	4.1	0.10	0.5	1.8	B1

228	780715	715	42.47	34-23.01	81-18.48	4.55	0.82	7	164	5.8	0.02	0.2	0.5	B1
229	780715	8 6	58.69	34-20.43	81-19.64	0.06	0.95	14	92	0.4	0.12	0.2	0.5	B1
230	780715	8 7	25.66	34-20.48	81-19.50	0.32	0.29	8	85	0.4	0.07	0.3	0.5	A1
231	780715	1754	55.91	34-21.83	81-20.33	1.00	1.44	14	155	1.5	0.08	0.3	1.0	B1
232	780715	1912	0.47	34-20.47	81-19.88	7.14	0.82	8	132	3.4	0.07	0.4	0.6	B1
233	780715	2320	44.06	34-20.35	81-20.07	1.00	1.18	11	131	0.8	0.10	0.4	1.0	B1
234	780717	854	22.30	34-20.81	81-20.93	0.20	0.87	17	85	1.2	0.09	0.2	0.4	A1
235	780717	1535	48.88	34-22.46	81-17.84	6.41	0.82	6	151	4.7	0.10	1.4	2.0	C1
236	780717	2337	41.04	34-20.43	81-20.08	1.73	1.18	10	132	3.7	0.09	0.4	1.3	B1
237	780717	2342	40.89	34-20.27	81-20.31	1.60	0.57	4	221	1.5	0.00			C1
238	780718	032	53.74	34-20.14	81-19.88	2.57	1.27	10	129	3.3	0.08	0.3	0.8	B1
239	780718	1652	43.66	34-20.01	81-19.19	0.08	1.34	9	127	2.2	0.05	0.2	0.5	B1
240	780718	1822	25.65	34-17.52	81- 7.63	0.94	1.18	9	249	12.3	0.10	0.9	16.9	D1
241	780719	2131	12.97	34-20.01	81-18.82	3.15	0.82	10	125	1.7	0.10	0.4	0.6	B1
242	780722	1829	4.93	34-21.00	81-20.13	4.49	1.06	8	141	4.2	0.05	0.2	0.4	B1
243	780724	1725	4.10	34-20.48	81-16.74	0.03	1.32	8	134	1.9	0.08	0.2	0.6	B1
244	780725	232	23.37	34-19.85	81-18.13	3.17	0.82	10	123	0.6	0.10	0.4	0.5	B1
245	780725	1337	20.20	34-20.53	81-17.84	1.91	1.02	10	124	1.2	0.10	0.4	0.6	B1
246	780726	1516	48.15	34-18.59	81-19.75	3.30	1.02	5	147	3.9	0.02	0.3	0.8	C1
247	780727	1916	29.19	34-25.09	81-23.72	3.57	1.44	8	229	9.3	0.06	0.5	1.5	C1
248	780727	20 1	19.95	34-17.35	81- 5.68	0.48	1.44	8	265	16.4	0.10	0.5	1.2	C1
249	780728	536	39.24	34-20.57	81-20.00	6.47	0.82	8	139	3.7	0.09	0.6	0.9	B1
250	780728	6 3	11.10	34-19.92	81-19.96	1.72	0.82	7	150	3.4	0.04	0.2	1.4	B1
251	780728	7 3	30.37	34-19.60	81-18.44	0.06	0.82	7	127	1.2	0.07	0.1	0.2	B1
252	780728	1948	12.28	34-17.88	81-20.68	4.31	0.82	6	261	5.9	0.00	0.1	0.1	C1
253	780729	757	12.46	34-19.99	81-20.62	0.39	0.44	8	262	4.4	0.07	0.7	1.6	C1
254	780730	1221	15.60	34-18.59	81-20.02	2.82	0.73	8	149	4.3	0.07	0.3	0.9	B1
255	780731	550	13.27	34-20.72	81-21.10	2.56	0.82	10	139	5.4	0.09	0.4	1.3	B1
256	780731	949	47.69	34-19.73	81-18.27	4.35	1.27	8	125	0.9	0.04	0.2	0.3	B1
257	780801	1357	40.80	34-23.46	81-18.39	1.00	1.10	10	171	2.8	0.14	0.7	5.2	C1
258	780801	1526	30.47	34-22.87	81-18.82	0.14	1.04	12	164	1.6	0.08	0.2	0.6	B1
259	780802	321	55.21	34-20.61	81-19.76	1.00		14	114	1.0	0.12	0.4	1.0	B1
260	780803	834	23.72	34-23.64	81-18.57	0.43	0.57	8	175	7.0	0.13	0.7	2.7	C1
261	780803	537	51.01	34-19.48	81-17.36	0.21	0.82	7	164	1.0	0.31	8.1	12.9	D1
262	780804	5 8	14.59	34-20.33	81-19.42	2.40	1.06	8	128	2.7	0.10	0.5	0.9	B1
263	780804	1242	3.53	34-18.47	81-20.09	0.08	1.18	23	114	3.3	0.07	0.1	0.3	B1
264	780805	624	27.66	34-22.72	81-18.50	1.97		6	318	4.8	0.03	0.9	2.4	C1
265	780805	1632	34.80	34-17.68	81- 6.77	0.07	1.44	10	256	13.6	0.11	1.1	2.8	C1
266	780806	2345	52.92	34-23.56	81-24.35	1.85	0.78	9	211	6.5	0.10	0.7	4.2	C1
267	780807	125	29.97	34-23.60	81-24.57	3.65	0.82	10	214	6.3	0.08	0.5	1.4	C1
268	780807	530	42.57	34-18.35	81-19.96	0.19	0.82	19	151	3.1	0.09	0.2	0.4	B1
269	780807	17 7	52.75	34-20.01	81-20.31	1.85	1.06	8	133	4.0	0.10	0.5	1.5	B1
270	780807	2134	24.07	34-20.36	81-16.38	1.09	1.68	5	139	2.2	0.05	0.7	2.4	C1
271	780807	2358	39.31	34-20.32	81-21.02	1.83		10	133	5.1	0.06	0.2	1.0	B1
272	780808	0 8	39.29	34-20.57	81-17.19	0.03	0.82	7	246	3.6	0.31	2.4	2.9	D1
273	780808	011	20.85	34-18.80	81-21.19	0.04	1.02	9	154	5.7	0.86	3.6	15.3	D1
274	780808	20 9	29.49	34-25.53	81-23.83	1.00	0.92	13	235	8.6	0.16	0.9	10.1	D1
275	780810	446	24.83	34-20.31	81-19.57	0.08	1.13	18	116	0.2	0.10	0.3	0.5	B1
276	780810	1047	17.49	34-17.85	81-17.75	0.99	0.82	8	208	3.8	0.08	0.8	2.4	C1
277	780810	1245	56.46	34-20.01	81-17.84	2.63	0.63	8	237	0.2	0.32	4.3	2.5	D1
278	780811	159	36.18	34-17.22	81-17.97	0.15	1.32	16	190	0.6	0.08	0.5	0.9	C1
279	780811	17 4	5.13	34-20.18	81-18.78	0.05	0.73	6	259	1.7	0.13	0.8	1.0	C1
280	780811	1912	41.77	34-17.33	81-17.66	3.28		8	188	3.3	0.02	0.1	0.2	C1
281	780812	2 8	8.87	34-20.31	81-18.54	0.09	1.00	11	117	1.4	0.11	0.3	0.5	B1
282	780812	17 4	4.95	34-19.99	81-18.88	1.89	0.21	9	214	1.0	0.05	0.6	0.7	C1
283	780812	1857	44.20	34-23.26	81-18.65	2.83	1.64	8	309	4.6	0.03	0.8	1.2	C1
284	780812	21 3	27.83	34-23.04	81-17.84	1.81	1.37	8	160	5.8	0.13	0.7	4.1	C1

285	780814	511	0.31	34-17.94	81-19.13	3.54	0.44	6	261	4.2	0.13	2.4	1.8	C1
286	780814	1449	2.49	34-22.06	81-17.48	5.96	1.18	6	142	4.0	0.03	0.3	0.4	B1
287	780815	854	28.45	34-21.18	81-20.21	1.00		8	216	0.2	0.26	3.4	1.6	D1
288	780815	429	32.07	34-21.00	81-17.64	5.19	0.63	6	145	2.0	0.03	0.5	0.5	B1
289	780815	854	27.65	34-23.24	81-18.17	3.44	1.44	8	166	6.2	0.12	0.6	2.1	C1
290	780815	1845	41.23	34-16.95	81- 7.46	0.49	1.64	6	312	16.7	0.26	18.2	41.7	D1
291	780815	2139	44.85	34-20.68	81-17.84	1.00	1.18	7	126	1.4	0.19	1.0	4.2	B1
292	780816	1230	10.60	35-40.51	81-15.81	1.99	1.18	4	351	138.3	0.08			C1
293	780817	1016	46.80	34-17.10	81-17.82	2.87	0.82	6	262	3.5	0.03	0.4	0.4	C1
294	780818	3 4	25.97	34-19.57	81-19.90	4.68	0.63	6	204	3.4	0.02	0.2	0.2	C1
295	780818	2128	25.61	34-20.89	81-19.07	7.66	0.82	8	135	2.7	0.44	2.3	3.3	C1
296	780819	2035	11.36	34-20.01	81-17.84	1.00		9	119	0.2	0.40	1.8	2.0	C1
297	780820	1322	35.45	34-19.09	81-20.61	1.83	0.63	9	146	4.7	0.43	2.2	8.3	C1
298	780821	944	30.70	34-20.01	81-17.84	1.00	0.91	6	137	0.2	0.56	6.7	5.3	D1
299	780821	1931	36.48	34-26.88	81-46.10	0.01	1.27	6	333	30.6	7.51	601.4		D1
300	780823	1150	30.19	34-23.38	81-18.33	1.95	0.73	10	169	6.5	0.07	0.3	1.8	B1
301	780823	1549	29.72	34-17.47	81- 5.68	1.95	1.50	4	265	15.3	0.02			C1
302	780823	1611	18.63	34-20.28	81-19.21	1.79	1.64	8	127	2.4	0.04	0.2	0.8	B1
303	780823	1610	57.12	34-20.15	81-14.87	1.96		8	158	4.4	0.45	4.5	15.7	C1
304	780823	1748	10.08	34-20.30	81-18.99	0.80	0.82	10	126	2.1	0.07	0.3	1.4	B1
305	780823	2129	15.05	34-20.27	81-16.80	0.14	1.64	5	134	1.6	0.04	0.1	0.2	C1
306	780827	1023	7.98	34-18.78	81-20.21	1.82	2.67	7	148	2.9	0.10	2.3	7.7	C1
307	780827	1058	16.84	34-19.85	81-18.73	7.33	2.45	4	166	1.5	0.02			C1
308	780827	1336	24.75	34-19.16	81-19.63	4.82	1.18	8	139	3.2	0.08	1.0	1.3	B1
309	780827	1753	30.22	34-19.62	81-19.32	5.20	1.44	8	155	2.5	0.04	0.4	0.4	B1
310	780828	350	0.57	34-19.32	81-19.46	5.66	1.32	6	143	2.9	0.06	0.5	0.5	B1
311	780828	1428	56.93	34-18.70	81-19.93	3.59	1.18	10	147	4.0	0.06	0.3	0.6	B1
312	780829	753	48.04	34-19.90	81-20.82	1.82	1.32	10	137	4.7	0.06	0.3	1.1	B1
313	780829	9 1	44.51	34-19.73	81-19.85	0.04	1.44	10	134	3.3	0.14	0.4	1.0	B1
314	780829	9 3	51.91	34-20.67	81-18.98	1.73	1.18	10	131	2.4	0.04	0.2	0.4	B1
315	780829	925	4.89	34-20.62	81-18.93	0.09	1.02	10	130	2.3	0.08	0.2	0.5	B1
316	780829	1857	23.89	34-21.20	81-19.22	0.40	1.44	7	140	3.3	7.55	38.6	173.9	D1
317	780829	1912	32.52	34-19.28	81-19.61	5.50	1.54	9	138	3.1	0.12	0.6	1.0	B1
318	780829	1940	9.92	34-18.63	81-20.00	0.15	1.18	10	148	4.2	0.06	0.2	0.4	B1
319	780829	2243	26.27	34-18.70	81-19.79	3.45	1.32	10	146	3.9	0.06	0.2	0.5	B1
320	780830	710	43.04	34-18.77	81-19.84	0.90	1.54	9	145	3.9	0.07	0.3	3.3	C1
321	780830	1326	40.41	34-18.73	81-19.92	3.07	1.39	9	146	4.0	0.02	0.1	0.3	B1
322	780830	1647	29.19	34-23.35	81-18.29	3.25	1.02	8	168	6.4	0.06	0.3	1.2	B1
323	780831	1248	44.12	34-16.90	81-18.01	0.22	1.44	9	152	3.7	0.37	1.7	4.3	C1
324	780831	512	58.95	34-18.59	81-19.74	1.91	1.32	10	146	3.9	0.09	0.4	1.3	B1
325	780902	2220	56.43	34-20.44	81-20.02	1.79		10	132	3.6	0.13	0.6	1.9	B1
326	780904	040	15.92	34-17.29	81-17.69	0.06	1.54	9	145	3.3	0.10	0.2	0.4	B1
327	780907	1239	28.64	34-20.65	81-20.77	0.43	2.00	9	137	4.8	0.11	0.3	1.4	B1
328	780907	1845	43.72	34-21.48	81-20.53	3.70	1.02	10	150	5.2	0.06	0.3	0.7	B1
329	780907	21 4	4.63	34-20.27	81-20.29	1.94	0.51	8	260	4.0	0.08	1.2	1.8	C1
330	780908	532	52.27	34-20.25	81-17.84	0.08	0.57	9	120	0.6	0.09	0.2	0.6	B1
331	780908	1743	11.50	34-19.91	81-20.17	3.10	0.44	6	191	3.7	0.02	0.2	0.3	C1
332	780910	6 8	12.15	34-19.89	81-17.67	0.01	1.32	9	120	0.1	0.13	0.2	0.6	B1
333	780910	1146	34.75	34-21.46	81-21.42	0.48		8	271	6.3	0.05	0.8	1.5	C1
334	780910	1429	53.23	34-19.86	81-17.37	0.00	0.82	9	123	0.6	0.11	0.1	0.4	B1
335	780910	1759	29.85	34-19.90	81-17.84	0.21	0.57	9	120	0.2	0.07	0.3	0.4	B1
336	780911	632	27.71	34-21.32	81-20.50	2.31	1.72	10	147	5.0	0.03	0.1	0.4	B1
337	780911	1041	47.69	34-20.21	81-20.03	1.76	1.12	10	129	3.6	0.07	0.3	1.0	B1
338	780914	0 0	56.22	34-20.78	81-19.05	1.00	0.95	10	133	2.6	0.17	0.7	3.3	B1
339	780914	1940	43.99	34-18.19	81-20.18	1.10	1.18	10	155	4.9	0.10	0.5	4.2	C1
340	780915	121	32.43	34-18.34	81-20.27	1.82	1.32	12	153	4.8	0.11	0.5	1.9	B1
341	780915	150	12.43	34-18.20	81-20.38	1.98	1.70	10	156	5.1	0.05	0.2	1.0	B1
342	780915	151	53.97	34-18.26	81-20.35	1.95	1.32	10	155	5.0	0.07	0.3	1.4	B1
343	780915	1228	1.66	34-18.18	81-20.06	0.45	2.05	7	154	4.8	0.06	0.4	2.3	C1

344	780915	1234	40.16	34-18.41	81-20.98	1.85	1.18	10	158	5.7	0.15	0.6	3.3	C1
345	780915	1442	0.30	34-18.32	81-19.62	1.89	1.02	10	149	4.1	0.11	0.5	1.8	B1
346	780915	1728	46.21	34-18.54	81-19.80	4.05	1.87	10	147	4.0	0.08	0.4	0.7	B1
347	780915	18 7	29.73	34-18.24	81-20.00	0.93	1.12	10	153	4.7	0.06	0.3	3.0	C1
348	780915	2140	7.63	34-17.94	81-20.15	1.93	1.18	10	157	5.2	0.11	0.5	2.2	C1
349	781001	050	49.12	34-21.22	81-20.62	1.86	0.21	8	146	5.0	0.09	0.5	2.1	C1
350	781001	1224	34.66	34-21.02	81-20.59	0.01	2.00	5	142	4.8	0.03	0.5	32.7	D1
351	781001	1233	43.34	34-22.90	81-17.49	0.31	1.02	8	229	5.5	0.05	1.0	1.8	C1
352	781001	1524	3.24	34-21.52	81-21.00	0.84	0.73	9	152	5.8	0.10	0.5	124.9	C1
353	781002	622	9.60	34-18.39	81-20.16	1.95	1.02	10	152	4.7	0.08	0.4	1.4	B1
354	781002	727	18.34	34-18.98	81-19.77	1.37	1.09	8	142	3.6	0.09	0.3	2.6	C1
355	781002	823	11.40	34-19.95	81-18.54	5.42	0.57	6	256	1.2	0.02	0.3	0.2	C1
356	781002	818	40.74	34-23.00	81-18.21	1.84	1.12	9	162	5.8	0.09	0.4	2.9	C1
357	781002	937	57.36	34-23.06	81-18.22	1.98	0.82	9	163	5.9	0.09	0.4	2.0	C1
358	781002	1814	4.82	34-18.46	81-20.05	1.91		8	150	7.5	0.04	0.2	1.5	B1
359	781003	813	17.98	34-16.94	81-14.57	7.09	0.21	5	252	1.6	0.12	0.6	0.4	C1
360	781003	939	4.33	34-18.19	81-20.05	1.80	2.25	5	154	7.3	0.06	0.8	5.3	D1
361	781003	1022	31.26	34-18.45	81-19.97	0.83		8	150	7.4	0.05	0.2	69.0	C1
362	781003	2028	59.68	34-18.44	81-19.38	1.83	0.73	8	250	3.7	0.06	0.7	1.1	C1
363	781004	1011	53.13	34-20.43	81-18.65	1.00	1.02	10	126	1.7	0.10	0.4	1.5	B1
364	781005	5 6	56.29	34-18.29	81-20.29	1.81	1.02	8	154	4.9	0.11	0.6	2.5	C1
365	781006	550	28.08	34-22.83	81-18.13	0.85	1.64	10	159	5.4	0.07	0.3	90.6	C1
366	781006	833	47.18	34-23.29	81-18.21	0.89	0.82	10	167	6.3	0.10	0.4	125.6	C1
367	781008	432	18.27	34-18.33	81-20.35	0.90	1.32	10	154	5.0	0.07	0.3	11.4	C1
368	781008	522	29.85	34-18.39	81-20.46	0.89	1.54	9	154	5.0	0.10	0.5	21.0	C1
369	781008	542	36.12	34-18.46	81-20.34	0.89	0.91	9	152	4.8	0.08	0.4	14.8	C1
370	781009	14 5	36.59	34-19.77	81-17.84	1.00	0.68	8	232	0.3	0.10	1.4	0.7	C1
371	781009	1939	46.17	34-21.16	81-18.57	3.52	1.02	7	248	2.6	0.06	0.8	0.6	C1
372	781010	215	39.83	34-19.58	81-18.36	1.00	1.32	9	127	1.1	0.08	0.3	1.1	B1
373	781010	428	47.77	34-19.87	81-17.84	0.49	1.02	7	236	0.2	0.08	1.4	0.7	C1
374	781010	648	24.09	34-19.66	81-18.83	1.57	0.82	8	246	1.7	0.07	0.8	0.9	C1
375	781010	11 4	35.87	34-18.40	81-20.34	0.84	0.73	10	153	4.9	0.07	0.3	83.8	C1
376	781010	1134	28.67	34-18.42	81-20.44	0.56	0.95	9	154	5.0	0.05	0.3	0.9	B1
377	781010	1933	40.90	34-18.46	81-20.30	1.92	1.02	10	152	4.8	0.06	0.3	1.2	B1
378	781012	210	19.23	34-19.67	81-18.54	3.08	0.57	10	127	1.3	0.12	0.5	0.7	B1
379	781012	7 3	30.15	34-19.85	81-18.38	1.73	1.18	10	124	1.0	0.06	0.2	0.5	B1
380	781012	7 5	1.87	34-19.95	81-18.66	0.28	0.91	7	245	1.4	0.05	0.4	0.5	C1
381	781013	514	47.16	34-19.55	81-18.20	1.60	1.18	8	126	1.0	0.12	0.7	1.4	B1
382	781013	520	31.70	34-19.69	81-18.22	0.24	1.44	9	125	0.8	0.10	0.5	1.2	B1
383	781013	548	17.07	34-19.69	81-18.19	1.00	1.37	9	124	0.8	0.09	0.4	1.1	B1
384	781013	632	36.66	34-19.78	81-18.25	1.75	0.82	9	124	0.8	0.07	0.3	0.8	B1
385	781013	751	27.17	34-19.37	81-16.80	1.79	0.91	8	143	1.8	0.09	1.3	2.3	C1
386	781013	10 9	31.11	34-19.82	81-18.46	1.00	1.24	9	125	1.1	0.07	0.4	1.0	B1
387	781013	1151	25.40	34-23.04	81-18.21	0.98	0.73	8	163	5.8	0.07	0.3	8.1	C1
388	781014	1922	7.04	34-19.63	81-17.84	1.00	0.44	8	219	0.5	0.05	0.6	0.5	C1
389	781015	549	11.00	34-19.47	81-18.39	1.04	1.02	8	128	6.5	0.09	0.4	10.1	C1
390	781016	18 6	52.35	34-20.26	81-20.07	0.73	1.09	10	129	3.6	0.08	0.4	0.9	B1
391	781016	1939	5.21	34-18.18	81-20.29	1.87	0.82	6	156	5.1	0.06	0.6	1.9	B1
392	781016	1940	18.48	34-18.14	81-18.50	0.72	0.37	6	230	3.5	0.04	1.2	1.1	C1
393	781016	1958	13.98	34-18.17	81-20.35	2.56	1.27	7	156	5.1	0.05	0.4	1.0	B1
394	781016	20 4	33.98	34-18.29	81-20.40	2.90	1.64	6	155	5.1	0.06	0.5	2.1	C1
395	781016	20 9	3.05	34-18.07	81-20.29	0.49	1.54	8	157	5.2	0.08	0.4	1.4	B1
396	781016	2050	35.27	34-18.14	81-18.09	1.93	1.02	6	218	3.3	0.04	0.8	0.8	C1
397	781017	318	0.34	34-18.37	81-20.43	0.94	0.82	10	154	5.0	0.06	0.3	6.9	C1
398	781017	355	49.26	34-18.29	81-20.08	0.81	1.54	7	153	4.7	0.07	0.5	3.3	C1
399	781017	547	46.75	34-18.31	81-20.40	2.12	2.22	5	155	5.0	0.00	0.0	0.2	C1
400	781017	554	0.05	34-18.24	81-19.96	1.94		10	152	4.6	0.06	0.3	1.0	B1
401	781017	555	46.80	34-18.32	81-18.25	4.43	0.29	8	224	3.0	0.02	0.2	0.1	C1

402	781017	617	42.84	34-18.46	81-19.77	1.84	0.57	8	253	4.1	0.05	0.6	1.0	C1
403	781017	1026	11.25	34-19.70	81-18.65	1.00	1.44	8	127	1.5	0.06	0.3	1.2	B1
404	781017	1345	18.32	34-18.32	81-20.34	0.44	0.73	5	154	5.0	0.05	0.6	6.6	D1
405	781018	156	37.92	34-19.46	81-18.44	1.02	0.57	8	242	1.4	0.08	1.0	0.8	C1
406	781018	2355	46.30	34-18.53	81-20.09	1.13	0.37	5	150	4.4	0.10	1.3	13.4	D1
407	781020	810	24.91	34-19.75	81-20.63	0.48	1.02	8	138	4.5	0.05	0.2	0.9	B1
408	781020	2137	51.79	34-18.50	81-20.07	0.58	1.12	10	150	4.4	0.03	0.1	0.5	B1
409	781021	255	43.70	34-20.16	81-20.20	2.79	0.57	9	131	3.8	0.11	0.6	1.2	B1
410	781022	1559	12.95	34-20.66	81-19.30	5.13	0.82	5	132	2.8	0.04	0.6	1.0	C1
411	781023	17 3	11.76	34-18.33	81-20.39	0.97	0.73	10	154	5.0	0.08	0.4	6.8	C1
412	781023	19 2	48.26	34-18.42	81-20.21	1.38	1.44	9	152	4.7	0.06	0.3	1.7	B1
413	781023	1757	15.05	34-20.32	81-17.13	1.90	1.15	6	161	1.2	0.07	1.5	2.2	C1
414	781024	3 6	50.18	34-22.91	81-18.12	1.87		6	160	5.6	0.08	0.7	4.0	C1
415	781024	1836	48.00	34-20.23	81-19.91	0.07	2.33	5	128	3.4	0.07	0.8	6.8	D1
416	781025	111	14.58	34-22.93	81-18.14	1.57	0.73	6	160	5.6	0.06	0.3	2.0	C1
417	781025	1614	40.48	34-16.90	81-20.25	1.00	2.20	5	170	6.8	0.20	3.0	67.0	D1
418	781025	1835	47.43	34-24.92	81-24.00	5.55		8	229	8.8	0.05	0.4	0.8	C1
419	781026	1716	48.86	34- 3.73	81- 5.66	1.00	1.44	5	329	19.2	0.10	4.4	208.4	D1
420	781027	726	2.43	34-17.86	81-20.18	0.23	2.41	5	158	5.3	0.02	0.3	2.4	C1
421	781027	1627	18.10	34-18.09	81-19.55	1.95	2.91	5	151	4.4	0.02	0.4	1.5	C1
422	781027	17 3	22.65	34-21.17	81-20.61	0.44	1.44	10	145	5.0	0.09	0.4	1.4	B1
423	781027	1933	16.68	34-18.18	81-19.20	2.79	1.29	8	147	3.9	0.08	0.4	1.0	B1
424	781027	2139	55.07	34-18.06	81-18.70	1.08	1.06	5	235	3.7	0.05	2.1	3.3	C1
425	781027	2142	53.40	34-20.19	81-18.47	1.00	1.39	5	244	1.2	0.03	0.9	0.8	C1
426	781028	1048	31.84	34-18.28	81-19.39	1.92	0.82	8	148	3.9	0.09	0.4	1.4	B1
427	781028	2326	27.90	34-17.56	81-18.34	0.83	0.78	6	224	4.4	0.17	2.9	265.6	D1
428	781029	358	39.86	34-18.20	81-18.32	1.31	0.91	6	225	3.3	0.03	0.6	0.9	C1
429	781102	20 4	1.06	34-17.86	81-19.26	1.90		6	247	4.4	0.03	0.2	0.5	C1
430	781102	20 4	42.88	34-17.99	81-18.51	1.96	0.57	8	230	3.7	0.04	0.5	0.6	C1
431	781102	2158	29.63	34-17.83	81-22.31	1.00	1.18	4	290	8.0	0.31			D1
432	781104	639	28.68	34-18.17	81-19.49	1.82	0.37	8	150	4.2	0.10	0.6	2.3	C1
433	781104	2054	42.65	34-17.81	81-19.38	0.81	1.32	9	153	4.6	0.05	0.2	1.1	B1
434	781104	2319	22.14	34-18.20	81-19.16	1.82	0.82	10	147	3.8	0.09	0.4	1.6	B1
435	781105	3 1	30.91	34-18.50	81-20.42	1.82	0.57	10	152	4.9	0.08	0.4	2.2	C1
436	781105	1646	51.95	34-18.37	81-18.94	1.87		10	143	3.4	0.05	0.3	0.8	B1
437	781105	2026	6.24	34-23.21	81-17.84	5.21	1.44	7	163	6.1	0.05	0.5	0.8	B1
438	781110	15 3	52.03	34-17.97	81-19.66	0.56	1.12	9	153	4.6	0.05	0.3	0.9	B1
439	781111	2131	42.23	34-23.55	81-18.47	1.91	1.18	5	173	6.8	0.07	1.0	7.4	D1
440	781113	1643	10.80	34-20.01	81-20.39	0.72	0.57	10	133	4.1	0.09	0.5	1.4	B1
441	781115	15 8	38.51	34-21.54	81-20.80	0.99	1.54	8	152	5.6	0.05	0.3	7.5	C1
442	781120	254	55.35	34-18.04	81-17.84	1.83	0.21	6	210	3.5	0.07	1.4	1.7	C1
443	781120	21 4	57.38	34-20.38	81-19.90	0.17	1.80	4	130	3.4	0.02			C1
444	781121	213	52.00	34-20.24	81-20.32	0.83	1.32	9	130	4.0	0.10	0.5	134.1	C1
445	781121	1137	28.98	34-20.93	81-19.70	4.30	0.82	8	257	3.6	0.06	0.9	0.6	C1
446	781122	21 6	15.39	34-18.04	81-20.07	1.87	1.12	9	155	5.0	0.06	0.3	1.4	B1
447	781122	2344	25.37	34-23.03	81-19.14	1.22	-0.11	7	168	6.2	0.02	0.2	1.5	B1
448	781123	2118	44.60	34-20.35	81-20.70	1.77		5	132	10.2	0.00	0.0	0.1	C1
449	781123	2141	25.04	34-20.01	81-20.14	1.71	1.02	8	132	3.7	0.07	0.5	1.8	B1
450	781124	1117	15.41	34-19.83	81-18.72	0.01	1.44	7	126	1.5	0.06	0.4	0.2	B1
451	781124	1118	11.16	34-20.08	81-18.53	0.12	0.82	8	123	1.3	0.06	0.3	0.9	B1
452	781124	1154	40.89	34-17.77	81-20.84	0.45	2.33	5	165	6.2	0.01	0.1	0.6	C1
453	781124	1158	52.88	34-19.45	81-25.54	0.31	1.44	7	188	4.2	0.26	2.7	13.1	D1
454	781124	1239	21.47	34-18.18	81-20.58	2.70	1.54	9	158	5.4	0.07	0.4	1.4	B1
455	781124	1241	9.91	34-18.34	81-19.07	1.79	1.44	8	145	3.6	0.10	0.8	2.3	C1
456	781124	1258	35.30	34-17.89	81-20.52	1.89	1.32	8	161	5.7	0.15	1.1	6.1	C1
457	781124	13 0	46.61	34-18.29	81-20.42	1.92	1.44	7	155	5.1	0.06	0.5	2.2	C1
458	781124	1344	3.47	34-18.45	81-20.50	0.47	2.25	6	154	5.0	0.04	0.3	1.4	B1
459	781124	1447	0.66	34-18.25	81-20.57	1.87	1.64	6	157	5.3	0.07	0.6	4.4	C1
460	781124	1519	15.33	34-18.60	81-20.53	4.48	1.18	9	152	4.9	0.20	1.2	2.2	C1

461	781125	026	10.13	34-19.91	81-20.06	1.58	1.93	8	133	3.6	0.05	0.3	1.5	B1
462	781125	3 0	10.74	34-20.01	81-20.49	1.89	1.18	8	134	4.2	0.09	0.6	2.8	B1
463	781125	321	4.28	34-20.19	81-20.60	1.77	2.16	7	132	4.4	0.08	0.6	2.9	B1
464	781125	626	40.79	34-18.75	81-17.84	1.69	1.44	6	209	2.2	0.16	4.2	3.3	D1
465	781125	1120	11.35	34-17.83	81-20.54	1.93	1.02	5	162	5.8	0.05	0.8	4.4	C1
466	781125	1120	43.00	34-18.12	81-20.20	0.96	1.54	7	187	5.0	0.06	0.5	11.6	D1
467	781125	1123	15.03	34-17.88	81-20.30	1.05	1.64	7	193	5.4	0.07	0.6	8.1	D1
468	781125	1758	35.91	34-20.01	81-20.89	3.76	1.21	7	136	4.8	0.07	0.6	1.2	B1
469	781125	2045	23.13	34-20.28	81-17.84	2.60	1.02	6	229	0.7	0.04	0.8	0.7	C1
470	781125	2228	37.07	34-22.68	81-17.84	0.08	1.37	5	235	5.1	0.06	3.1	3.7	D1
471	781126	541	15.71	34-19.39	81-20.30	1.77	1.84	5	141	4.1	0.10	1.5	6.1	D1
472	781128	1037	1.29	34-17.64	81-18.64	0.21	0.87	7	149	4.9	0.06	0.4	1.9	B1
473	781129	150	4.09	34-18.99	81-19.78	0.44	0.87	8	142	3.6	0.03	0.2	0.9	B1
474	781129	953	46.35	34-19.74	81-17.84	0.30	1.12	7	227	0.4	0.07	1.8	0.9	C1
475	781129	1052	45.15	34-17.49	81-19.02	0.51	1.34	9	154	4.9	0.06	0.4	1.2	B1
476	781130	531	34.71	34-20.39	81-20.23	0.94	1.54	6	144	3.9	0.05	0.5	7.7	C1
477	781130	540	32.15	34-20.33	81-20.21	2.00	0.21	6	145	3.9	0.09	0.8	3.4	C1
478	781130	7 9	37.32	34-20.24	81-19.12	2.39	0.95	8	126	2.2	0.11	1.1	1.1	B1
479	781130	914	39.32	34-20.68	81-20.17	0.65	1.50	8	136	4.0	0.05	0.3	1.1	B1
480	781130	1418	3.89	34-18.60	81-19.27	2.00	1.09	10	143	3.4	0.07	0.3	0.8	B1
481	781130	1636	32.94	34-20.49	81-19.42	4.22	0.87	6	253	2.8	0.04	1.5	0.6	C1
482	781130	17 4	43.23	34-20.51	81-19.96	0.33	0.82	6	140	3.6	0.08	0.9	4.2	C1
483	781130	1738	11.86	34-20.58	81-19.89	1.90	0.95	8	133	3.5	0.09	0.6	1.6	B1
484	781201	255	24.65	34-20.89	81-20.05	0.45	0.57	9	139	4.0	0.08	0.4	1.5	B1
485	781203	213	34.03	34-20.84	81-20.10	0.85	0.63	6	157	4.0	0.05	0.5	92.3	C1
486	781203	1047	21.53	34-20.38	81-20.42	1.93	1.88	8	145	4.2	0.05	0.3	1.2	B1
487	781203	1112	31.38	34-20.49	81-20.26	0.44	0.57	7	142	4.0	0.04	0.3	0.9	B1
488	781203	1622	44.88	34-18.48	81-20.53	0.93	1.06	8	182	5.0	0.06	0.4	9.7	D1
489	781203	1649	40.09	34-19.88	81-18.70	0.13	2.13	6	139	1.5	0.04	0.3	1.1	B1
490	781204	131	8.61	34-19.83	81-18.40	1.00	0.99	7	137	1.0	0.06	0.4	0.9	B1
491	781204	356	28.12	34-19.86	81-17.99	0.01	1.32	6	132	0.4	0.19	1.4	0.4	B1
492	781205	338	33.04	34-20.36	81-20.68	1.87	1.42	8	133	4.6	0.10	0.6	2.5	B1
493	781205	820	47.85	34-20.55	81-20.31	0.93	0.44	9	134	4.1	0.08	0.4	7.8	C1
494	781205	1752	10.61	34-25.05	81-23.52	1.89	1.02	7	226	9.4	0.10	0.9	11.4	D1
495	781206	156	10.59	34-20.32	81-20.61	0.96	1.02	9	132	4.5	0.07	0.4	6.5	C1
496	781206	533	55.08	34-20.39	81-20.72	1.60	0.51	8	133	4.7	0.09	0.5	3.6	B1
497	781207	336	40.23	34-18.12	81-19.74	0.87	0.63	9	152	4.5	0.08	0.5	18.8	C1
498	781208	1423	14.93	34-21.44	81-20.74	0.29	0.87	7	150	5.4	0.04	0.3	1.6	B1
499	781210	1557	34.11	34-18.09	81-20.21	0.48	1.24	5	188	5.1	0.15	1.9	4.8	C1
500	781210	17 8	2.17	34-16.77	81-19.34	0.00		4	213	5.7	0.15			C1
501	781210	1754	21.39	34-18.25	81-20.22	1.13	1.34	10	154	4.9	0.09	0.4	5.1	C1
502	781211	1029	32.57	34-17.83	81-19.80	1.24	0.87	8	156	5.0	0.03	0.2	1.5	B1
503	781211	1439	14.70	34-18.24	81-19.75	0.18	0.78	8	151	4.4	0.09	0.5	1.5	B1
504	781212	126	47.03	34-20.37	81-18.48	0.70	0.68	9	125	1.4	0.04	0.2	0.5	B1
505	781212	4 5	53.54	34-18.85	81-19.36	1.68	1.44	6	165	3.2	0.08	0.7	2.6	C1
506	781212	557	51.29	34-20.23	81-20.70	1.94	0.82	6	150	4.6	0.07	0.6	3.5	C1
507	781212	723	51.62	34-20.51	81-18.60	0.27	0.29	6	128	1.7	0.07	0.6	1.4	B1
508	781212	1721	39.05	34-20.22	81-17.84	1.88	0.68	4	231	0.6	0.05			C1
509	781213	031	13.78	34-20.52	81-20.46	2.80	1.32	7	143	4.3	0.06	0.5	1.8	B1
510	781213	129	1.31	34-20.33	81-20.79	1.89	1.15	8	148	4.7	0.07	0.4	1.6	B1
511	781213	333	16.52	34-20.89	81-20.57	1.15	1.18	7	140	4.7	0.05	0.3	4.6	C1
512	781213	1913	12.40	34-20.30	81-15.70	1.93		6	204	6.5	0.03	1.3	1.8	C1
513	781214	1112	53.18	34-20.92	81-20.07	0.87	1.91	8	139	4.0	0.05	0.3	13.6	C1
514	781215	322	3.41	34-20.89	81-19.91	2.57	1.54	8	138	3.8	0.03	0.2	0.6	B1
515	781217	338	31.71	34-18.78	81-19.37	1.92	1.81	7	167	3.3	0.06	0.4	1.6	B1
516	781217	9 5	47.65	34-18.71	81-19.41	1.56	1.44	7	169	3.4	0.09	0.6	2.9	C1
517	781219	1910	16.89	34-17.53	81- 7.43	0.97	1.48	5	293	12.6	0.07	2.5	158.7	D1
518	781220	2310	23.05	34-20.44	81-20.59	1.92	1.62	8	134	4.5	0.11	0.6	3.4	B1
519	781222	2310	54.26	34-20.01	81-20.03	0.67	0.73	9	132	3.5	0.07	0.4	1.1	B1
520	781223	1447	24.86	34-20.01	81-19.50	1.00	1.54	6	269	2.7	0.03	0.6	1.6	C1

521	781223	1612	6.06	34-20.50	81-20.44	0.21	0.87	8	143	4.3	0.04	0.2	0.6	B1
522	781223	22 9	49.53	34-17.51	81-17.06	0.50	1.24	7	172	2.6	0.04	0.3	0.8	B1
523	781228	12 0	35.38	34-19.44	81-18.45	1.57	0.63	9	129	1.4	0.08	0.6	0.7	B1
524	781229	1211	17.59	34-21.29	81-20.07	1.03	0.91	10	145	4.4	0.07	0.4	3.5	C1
525	790101	931	4.08	34-20.72	81-20.10	3.40	0.91	7	136	3.9	0.08	0.6	1.2	B1
526	790103	19 6	6.27	34-19.42	81-18.36	3.16	1.39	9	128	1.3	0.06	0.3	0.6	B1
527	790104	152	0.41	34-19.28	81-18.48	0.87	0.37	8	130	6.4	0.10	0.5	130.2	C1
528	790107	529	44.36	34-20.05	81-20.31	0.08	0.82	9	139	4.3	0.05	0.2	0.6	B1
529	790108	0 4	42.59	34-22.31	81-18.18	1.90		5	151	4.5	0.09	1.2	5.2	D1
530	790108	1 4	33.92	34-22.29	81-18.31	1.89		5	151	4.5	0.05	0.6	2.5	C1
531	790108	832	16.89	34-17.11	81-20.72	0.06		4	172	7.9	0.08			C1
532	790108	1113	6.12	34-23.36	81-19.15	0.49		5	174	6.7	0.02	0.4	54.0	D1
533	790109	1443	47.77	34-19.87	81-17.84	1.63		4	236	0.2	0.01			C1
534	790110	138	2.47	34-28.40	81- 5.63	7.20	0.91	10	314	12.3	0.08	0.7	1.8	C1
535	790111	4 7	58.67	34-18.47	81-19.21	1.32	1.06	10	144	3.5	0.08	0.4	1.9	B1
536	790112	253	27.51	34-20.26	81-20.56	1.97	0.82	10	131	4.4	0.08	0.4	1.3	B1
537	790112	2114	1.21	34-18.03	81-20.55	0.96	0.57	9	159	5.5	0.09	0.5	13.6	C1
538	790113	12 4	46.29	34-20.32	81-19.76	0.85	0.37	10	129	3.2	0.05	0.2	7.3	C1
539	790121	746	2.84	34-18.45	81-19.26	1.82	0.78	8	145	3.6	0.08	0.4	1.3	B1
540	790126	1436	10.35	34-20.42	81-19.98	1.78		7	131	3.6	0.08	0.5	2.2	B1
541	790127	012	9.10	34-20.21	81-19.88	1.78		10	128	3.3	0.07	0.3	1.0	B1
542	790127	215	11.98	34-20.36	81-20.05	1.67		10	131	3.6	0.08	0.4	1.4	B1
543	790201	125	48.44	34-19.82	81-19.04	1.12	2.61	5	128	2.0	0.02	0.3	1.0	C1
544	790201	3 0	42.20	34-20.01	81-19.12	1.04	0.95	9	127	2.1	0.05	0.2	6.0	C1
545	790201	321	45.08	34-19.31	81-19.56	0.01	1.44	7	137	3.0	0.11	0.8	0.3	B1
546	790201	323	39.47	34-19.53	81-19.01	1.70	1.18	8	131	2.1	0.03	0.2	0.8	B1
547	790201	852	41.55	34-19.86	81-19.20	1.12	0.57	9	129	2.2	0.02	0.1	0.5	B1
548	790201	2015	59.55	34-19.55	81-17.84	2.57	1.02	7	215	0.7	0.07	1.0	0.9	C1
549	790202	214	42.46	34-20.25	81-20.18	2.78	0.82	10	129	3.8	0.13	0.6	1.4	B1
550	790202	452	3.39	34-20.15	81-20.25	1.93	0.82	10	131	3.9	0.07	0.2	0.7	B1
551	790202	1644	35.94	34-20.01	81-18.24	4.25	0.57	7	241	0.8	0.03	0.6	0.3	C1
552	790203	157	30.30	34-20.50	81-19.89	2.42	0.37	10	132	3.5	0.08	0.3	0.8	B1
553	790203	721	53.68	34-19.71	81-19.11	1.64	1.54	9	130	2.1	0.08	0.4	1.3	B1
554	790203	739	3.56	34-19.81	81-19.34	1.90	0.21	8	251	2.5	0.06	1.0	0.9	C1
555	790204	19 5	11.06	34-19.85	81-19.14	1.13		10	128	2.2	0.05	0.2	0.8	B1
556	790206	136	55.89	34-20.01	81-19.27	0.49		7	127	2.4	0.03	0.2	0.6	B1
557	790210	1034	25.49	34-19.56	81-19.21	2.56	0.82	7	150	2.4	0.04	0.3	0.5	B1
558	790211	1040	25.44	34-20.01	81-17.84	1.89	0.37	8	128	0.2	0.29	1.7	2.0	B1
559	790211	1739	11.19	34-18.16	81-19.44	0.83	1.44	8	181	4.1	0.12	0.7	168.7	D1
560	790212	1152	25.79	34-20.35	81-19.34	1.93	1.02	10	128	2.6	0.06	0.3	0.6	B1
561	790212	1844	17.41	34-20.01	81-19.45	2.63	0.82	8	252	2.6	0.06	1.0	0.7	C1
562	790216	544	10.89	34-18.39	81-20.44	2.76	1.18	10	154	5.0	0.09	0.5	1.3	B1
563	790216	1437	9.12	34-20.42	81-20.25	0.12	2.72	5	132	4.0	0.02	0.0	0.1	C1
564	790216	2232	22.87	34-20.01	81-19.77	1.84	1.72	7	130	3.1	0.10	0.6	2.4	B1
565	790220	2233	41.11	34-19.60	81-18.52	0.71	0.68	7	142	1.3	0.03	0.2	0.3	B1
566	790220	2320	45.55	34-19.32	81-21.32	1.94	2.25	5	171	5.6	0.07	1.1	6.6	D1
567	790224	1 6	9.08	34-20.25	81-20.04	1.86	1.18	8	129	3.6	0.06	0.3	1.1	B1
568	790224	931	43.00	34-19.74	81-18.87	1.53	1.72	7	128	1.8	0.03	0.2	0.6	B1
569	790228	14 4	50.66	34-19.85	81-20.24	1.90	0.82	8	153	3.8	0.06	0.4	1.1	B1
570	790228	2034	52.26	34-20.01	81-20.00	2.66	0.57	10	131	3.5	0.10	0.5	1.0	B1
571	790301	418	1.53	34-21.30	81-19.23	1.90	0.21	8	141	3.4	0.35	2.2	5.1	C1
572	790301	428	27.91	34-20.17	81-19.91	1.25	0.82	10	129	3.4	0.06	0.3	1.3	B1
573	790301	639	12.79	34-20.21	81-19.93	2.58	0.91	10	129	3.4	0.08	0.3	0.8	B1
574	790301	2229	32.01	34-20.34	81-19.80	1.76	0.73	10	130	3.3	0.07	0.3	1.2	B1
575	790303	16 6	8.90	34-20.16	81-20.82	1.79	1.18	10	134	4.7	0.05	0.3	1.1	B1
576	790303	1646	58.65	34-19.86	81-20.82	1.85	0.57	8	138	4.7	0.07	0.4	1.5	B1
577	790307	952	6.76	34-20.41	81-19.80	1.70	0.73	10	131	3.3	0.08	0.3	1.3	B1
578	790310	855	34.45	34-19.87	81-20.94	1.85	1.32	9	138	4.9	0.04	0.2	1.1	B1
579	790310	1828	59.83	34-20.14	81-20.96	1.89	0.82	10	135	5.0	0.09	0.4	2.1	B1
580	790314	2150	56.07	34-20.82	81-19.60	1.75	0 44	9	136	3.3	0.22	1.1	3.1	C1

581	790318	1913	33.88	34-22.48	81-19.33	0.03	1.44	10	160	5.3	0.08	0.3	0.9	B1
582	790319	2 0	48.74	34-18.54	81-19.39	4.61	0.82	10	145	3.6	0.10	0.5	0.8	B1
583	790322	317	46.87	34-23.22	81-18.51	3.17	1.72	8	167	6.2	0.07	0.4	1.3	B1
584	790322	1242	57.62	34-19.77	81-19.36	1.89	0.95	8	131	2.5	0.04	0.2	0.5	B1
585	790327	532	0.65	34-20.68	81-20.77	0.79	0.29	9	138	4.9	0.11	0.6	3.7	C1
586	790401	127	21.57	34-19.02	81-20.33	1.11	0.91	9	146	4.3	0.50	2.6	32.8	C1
587	790401	1919	18.72	34-20.46	81-20.56	0.97	1.50	9	134	4.4	0.04	0.2	7.7	C1
588	790402	820	13.03	34-20.25	81-20.08	0.29	1.18	7	129	3.7	0.04	0.2	0.6	B1
589	790403	1840	52.70	34-20.26	81-20.29	0.91	1.02	10	130	4.0	0.10	0.4	8.6	C1
590	790406	631	41.63	34-19.88	81-18.41	1.28	0.82	6	124	1.0	0.02	0.2	0.3	B1
591	790407	2 3	14.78	34-20.49	81-19.47	0.06	0.82	8	131	2.9	0.05	0.2	0.6	B1
592	790407	332	57.80	34-20.52	81-20.25	1.92	0.01	9	134	4.0	0.08	0.4	1.5	B1
593	790410	251	5.32	34-19.81	81-18.27	0.59	0.82	7	124	0.8	0.03	0.2	0.3	B1
594	790421	312	42.01	34-22.88	81-19.05	1.83	1.12	8	165	5.9	0.07	0.4	2.3	C1
595	790421	1238	2.34	34-20.01	81-20.57	0.92	0.82	8	134	4.3	0.07	0.4	7.5	C1
596	790422	952	12.20	34-22.05	81-18.09	1.79	0.21	10	146	4.0	0.06	0.3	0.9	B1
597	790422	1035	43.17	34-18.80	81-20.28	2.97	0.21	10	148	4.4	0.08	0.4	0.9	B1
598	790422	1634	15.74	34-20.14	81-20.20	2.04	0.87	9	131	3.8	0.08	0.2	1.1	B1
599	790423	1931	6.91	34-20.42	81-20.88	1.99	1.18	7	134	4.9	0.05	0.4	1.3	B1
600	790424	949	56.39	34-19.66	81-18.64	1.00	1.39	8	128	1.5	0.08	0.4	1.4	B1
601	790429	924	46.91	34-19.94	81-19.90	1.14	0.21	8	132	3.3	0.03	0.2	1.1	B1
602	790508	1119	51.77	34-20.36	81-20.66	0.03	1.80	5	132	4.6	0.05	0.8	2.1	C1
603	790508	1831	25.87	34-20.27	81-20.71	1.92	0.82	8	149	4.6	0.06	0.3	1.6	B1
604	790510	2328	41.77	34-20.37	81-20.38	1.67	0.78	10	132	4.1	0.06	0.3	1.2	B1
605	790511	6 3	14.31	34-18.50	81-20.23	1.97	0.37	10	151	4.6	0.08	0.4	1.5	B1
606	790512	218	9.74	34-19.38	81-18.30	1.00	0.91	9	128	1.3	0.09	0.4	2.3	B1
607	790515	225	33.60	34-20.59	81-20.49	0.49	0.73	7	136	4.4	0.05	0.4	1.5	B1
608	790517	1411	56.49	34-20.04	81-19.94	1.76	0.68	9	131	3.4	0.07	0.3	1.1	B1
609	790518	942	26.40	34-22.09	81-18.79	1.92	1.27	8	254	4.3	0.09	1.2	1.5	C1
610	790518	1740	24.77	34-20.01	81-19.63	1.68	1.18	8	129	2.9	0.07	0.4	1.1	B1
611	790521	026	19.30	34-20.92	81-20.68	0.71	-0.60	9	141	4.9	0.05	0.3	1.6	B1
612	790523	9 1	2.63	34-20.87	81-19.54	3.04	0.99	9	136	3.3	0.04	0.2	0.5	B1
613	790529	0 0	3.33	34-20.12	81-20.40	1.07	1.27	9	132	4.1	0.07	0.4	4.6	B1
614	790529	341	51.09	34-20.40	81-20.54	0.85	0.91	8	133	4.4	0.07	0.4	101.2	C1
615	790605	937	44.23	34-18.57	81-19.54	1.92	2.41	6	145	3.7	0.08	0.7	2.9	C1
616	790605	940	2.10	34-18.67	81-19.44	2.79	2.33	7	144	3.5	0.06	0.4	1.3	B1
617	790605	944	44.52	34-18.27	81-19.45	1.01	1.06	6	178	6.5	0.09	1.2	31.9	C1
618	790605	10 2	2.58	34-18.35	81-19.38	1.89	1.44	10	147	3.8	0.08	0.4	1.5	B1
619	790606	639	28.09	34-18.60	81-19.57	2.42	0.99	10	145	3.7	0.08	0.4	0.8	B1
620	790606	859	44.71	34-20.44	81-20.13	1.95	1.18	9	130	3.7	0.10	0.4	2.2	B[illegible]
621	790607	17 0	29.98	34-20.01	81-20.21	1.78	1.02	8	150	3.8	0.08	0.5	1.8	B1
622	790609	915	23.20	34-20.28	81-20.01	0.02	0.91	8	129	3.5	0.14	0.7	0.2	B1
623	790610	1156	40.46	34-18.42	81-19.50	1.90	0.99	10	147	3.9	0.08	0.4	1.2	B1
624	790612	143	53.44	34-20.91	81-19.77	3.36	0.44	10	138	3.6	0.09	0.4	0.7	B1
625	790613	9 4	38.42	34-20.20	81-20.11	1.83	0.51	10	130	3.7	0.07	0.3	0.9	B1
626	790613	1024	12.50	34-20.16	81-20.11	2.03	0.82	10	130	3.7	0.07	0.3	0.9	B1
627	790614	752	12.17	34-19.83	81-20.14	2.28	1.54	9	134	3.7	0.07	0.3	1.5	B1
628	790616	1022	7.94	34-19.82	81-19.79	2.50	0.01	7	150	3.2	0.02	0.2	0.3	B1
629	790619	1 5	53.72	34-23.18	81-18.00	3.28	1.80	8	164	6.1	0.03	0.2	0.7	B1
630	790619	1 9	39.06	34-23.35	81-18.40	0.73	0.73	7	169	6.4	0.06	0.4	1.8	B1
631	790619	112	0.55	34-22.89	81-17.84	1.86	0.21	6	236	5.5	0.08	1.2	2.5	C1
632	790619	113	22.59	34-22.95	81-18.30	1.87	0.21	4	246	5.7	0.01			C1
633	790620	225	25.53	34-20.11	81-19.89	1.84	1.02	10	130	3.3	0.09	0.4	1.4	B1
634	790620	1457	7.89	34-20.01	81-18.82	1.52	1.18	6	247	1.7	0.10	2.2	1.6	C1
635	790620	2110	48.57	34-22.92	81-18.30	1.82	0.82	6	161	5.6	0.07	0.5	3.1	C1
636	790620	2324	46.47	34-22.99	81-18.27	1.19	0.29	6	162	5.8	0.05	0.8	10.8	C1
637	790621	1126	51.89	34-20.30	81-19.79	2.84	0.01	8	129	3.2	0.09	0.6	0.8	B1
638	790622	931	41.69	34-19.46	81-19.86	0.96	0.37	6	209	3.4	0.10	1.8	9.4	D1
639	790626	1027	5.65	34-20.57	81-19.99	0.24	0.68	9	134	3.7	0.12	0.6	1.6	B1

640	790626	1027	41.71	34-20.85	81-20.01	2.20		10	138	3.9	0.09	0.4	1.2	B1
641	790630	135	9.24	34-20.29	81-19.87	1.24	1.87	7	129	3.3	0.05	0.4	2.6	B1
642	790701	1628	23.18	34-20.53	81-19.20	1.84		5	251	8.8	0.05	2.0	11.8	D1
643	790702	131	7.50	34-20.42	81-19.88	2.40	0.78	10	131	3.4	0.07	0.3	0.7	B1
644	790702	1615	7.07	34-20.38	81-20.26	1.80	1.02	10	132	4.0	0.08	0.4	1.2	B1
645	790703	022	23.66	34-20.16	81-20.29	1.05	0.87	10	131	3.9	0.07	0.3	2.6	B1
646	790703	220	53.52	34-20.31	81-20.40	4.20	0.37	8	146	4.2	0.05	0.3	0.6	B1
647	790704	655	19.14	34-20.33	81-19.75	0.85	0.95	9	129	3.2	0.03	0.2	8.0	C1
648	790704	2049	2.14	34-20.43	81-19.66	4.38	0.73	10	130	3.1	0.11	0.6	0.8	B1
649	790705	2025	20.33	34-20.34	81-20.15	4.23	0.01	9	131	3.8	0.10	0.6	0.8	B1
650	790713	020	3.78	34-20.21	81-18.33	3.49	0.12	8	242	1.1	0.06	0.9	0.3	C1
651	790713	435	48.98	34-23.12	81-19.07	1.85	1.27	10	169	6.3	0.06	0.3	1.9	B1
652	790713	547	54.59	34-18.76	81-20.39	1.90	1.54	8	149	4.6	0.04	0.3	0.9	B1
653	790713	1753	12.54	34-18.58	81-20.13	0.82	0.91	10	149	4.4	0.04	0.2	53.5	C1
654	790713	2251	45.13	34-20.44	81-19.73	2.45	0.73	10	131	3.2	0.05	0.2	0.5	B1
655	790714	157	7.61	34-18.77	81-20.34	1.69	1.72	9	149	4.5	0.08	0.2	1.3	B1
656	790721	11 6	43.26	34-19.79	81-18.24	2.20	0.95	9	124	0.8	0.09	0.6	0.6	B1
657	790722	1044	12.31	34-22.65	81-18.84	1.84	0.37	9	160	5.3	0.10	0.5	2.5	C1
658	790731	630	45.79	34-21.00	81-20.26	1.90	0.21	8	141	10.6	0.06	0.3	3.1	C1
659	790802	1036	23.49	34-23.04	81-18.86	3.70	1.09	8	167	6.0	0.09	0.5	1.5	B1
660	790805	20 2	19.46	34-17.47	81-19.23	1.87	1.02	10	156	5.1	0.06	0.3	1.2	B1
661	790805	2010	21.56	34-17.49	81-18.98	2.56	1.18	10	153	4.9	0.07	0.3	1.0	B1
662	790806	417	5.78	34-20.13	81-21.32	1.81	0.95	10	137	5.5	0.10	0.4	2.0	B1
663	790806	424	4.18	34-20.20	81-21.26	3.35	1.02	10	136	5.4	0.07	0.3	0.8	B1
664	790806	1342	1.02	34-20.39	81-21.39	1.95	0.91	10	135	5.7	0.08	0.4	1.6	B1
665	790806	1521	25.60	34-20.51	81-21.54	1.82	1.62	9	137	5.9	0.06	0.3	1.4	B1
666	790807	1932	17.20	34-19.99	81-21.46	2.85	2.55	5	140	5.7	0.01	0.2	0.8	C1
667	790812	1839	20.86	34-21.45	81-20.49	5.02	1.09	7	149	5.1	0.14	1.3	2.1	C1
668	790812	1859	44.15	34-21.51	81-20.58	0.49	0.91	10	150	5.3	0.09	0.4	1.4	B1
669	790819	1643	29.70	34-20.04	81-20.43	0.88	0.01	8	133	9.5	0.07	0.3	102.1	C1
670	790830	243	42.60	34-20.17	81-20.39	2.39	-0.24	10	131	4.1	0.09	0.4	1.0	B1
671	790914	045	31.40	34-20.24	81-19.41	2.44	2.66	5	127	2.6	0.01	0.2	0.5	C1
672	790914	1 0	29.44	34-20.19	81-19.39	1.80	0.57	8	126	2.6	0.08	0.5	1.6	B1
673	790914	123	16.18	34-20.01	81-19.29	1.86	1.18	9	127	2.4	0.07	0.3	1.2	B1
674	790914	2 6	18.64	34-20.23	81-19.54	1.80		8	127	2.8	0.06	0.3	1.4	B1
675	790921	113	20.83	34-20.01	81-19.48	3.22	0.57	10	128	2.7	0.10	0.4	0.8	B1
676	790923	241	54.18	34-22.45	81-17.60	0.32	1.32	8	227	4.7	0.03	0.9	1.5	C1
677	790923	6 9	7.67	34-22.48	81-17.94	3.52	1.64	9	152	4.8	0.06	0.3	0.7	B1
678	790924	18 9	23.66	34-18.39	81-20.46	0.57	1.32	9	154	5.0	0.05	0.2	0.8	B1
679	790927	1133	47.41	34-22.47	81-17.84	1.85	1.44	5	151	4.7	0.06	0.7	3.6	C1
680	790927	1222	2.45	34-22.44	81-18.07	1.77	1.02	10	152	4.7	0.07	0.3	1.4	B1
681	790928	957	2.05	34-22.15	81-18.19	3.41	1.44	5	148	4.2	0.06	0.9	2.4	C1

CONS: VSPC WILL BE DOWN AT 5 FOR 30 MIN

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APPENDIX VIII

	DATE	ORIGIN		LAT N	LONG W	DEPTH	MAG	NO	GAP	DMIN	RMS	ERH	ERZ	QM
1	780710	1128	59.01	34-17.93	81-20.38	0.43	1.18	15	160	4.2	0.08	0.3	1.2	B1
2	780710	1142	5.44	34-18.05	81-20.16	0.45	1.34	14	156	3.9	0.06	0.2	1.0	B1
3	780710	1151	17.47	34-17.91	81-20.34	0.91	0.82	9	288	4.1	0.05	0.5	6.0	D1
4	780711	1144	25.96	34-20.44	81-19.73	0.47	0.44	12	114	0.6	0.08	0.3	0.7	B1
5	780713	1246	48.76	34-20.62	81-18.98	0.12	0.65	7	110	1.2	0.03	0.3	0.9	B1
6	780715	8 6	59.56	34-20.31	81-19.77	0.11	0.95	12	99	0.5	0.07	0.2	0.4	B1
7	780715	1754	55.85	34-21.90	81-20.46	1.69	1.14	13	157	1.4	0.09	0.3	0.7	B1
8	780825	1046	39.29	34-22.33	81-18.68	1.64	-0.24	9	143	1.3	0.10	0.8	1.4	B1
9	780827	1023	7.98	34-18.49	81-20.06	0.10	2.67	11	93	3.1	0.02	0.1	0.9	A1
10	780827	1058	17.23	34-18.38	81-20.05	0.24	2.45	9	95	3.3	0.03	0.1	0.7	A1
11	780827	1336	24.99	34-18.49	81-20.27	1.79	1.18	12	119	3.1	0.06	0.3	1.3	B1
12	780827	1753	30.44	34-18.47	81-20.13	0.91	1.41	10	151	3.4	0.05	0.4	6.1	C1
13	780828	350	0.81	34-18.60	81-20.06	1.13	1.18	23	112	2.9	0.06	0.2	0.8	B1
14	780828	1428	56.89	34-18.45	81-20.19	1.03	1.09	23	96	3.2	0.06	0.2	1.1	A1
15	780829	753	47.99	34-19.99	81-20.69	0.74	1.22	26	64	0.6	0.05	0.1	0.2	A1
16	780829	9 1	44.36	34-20.61	81-19.07	1.90	1.31	27	78	1.0	0.09	0.2	0.5	A1
17	780829	9 3	51.84	34-20.54	81-19.12	1.00	1.10	19	75	0.8	0.07	0.2	0.5	A1
18	780829	925	4.80	34-20.56	81-18.99	1.00	0.92	17	78	1.0	0.09	0.3	0.7	A1
19	780907	1239	28.55	34-21.50	81-20.60	0.10	1.06	12	99	1.0	0.03	0.1	0.4	B1
20	780907	1845	43.72	34-21.50	81-20.47	0.62	0.73	18	96	1.2	0.08	0.2	0.5	B1
21	780907	21 4	4.77	34-20.05	81-19.07	2.69	0.26	14	117	0.7	0.08	0.3	0.4	B1
22	780908	532	52.22	34-20.08	81-18.20	0.72	0.0	17	73	2.0	0.06	0.2	0.6	A1
23	780908	1743	11.57	34-20.47	81-20.34	0.66	0.44	10	124	1.3	0.04	0.2	0.4	B1
24	780910	6 8	12.01	34-19.84	81-17.84	0.09	1.32	18	117	0.2	0.07	0.2	0.4	B1
25	780910	1146	34.85	34-21.42	81-20.55	0.59	0.0	20	94	1.0	0.06	0.2	0.4	B1
26	780910	1429	53.07	34-19.86	81-17.77	0.10	0.82	21	74	0.1	0.07	0.2	0.3	A1
27	780910	1759	29.72	34-19.92	81-17.93	0.35	0.57	19	69	0.3	0.07	0.2	0.3	A1
28	780914	0 0	56.12	34-20.61	81-19.13	1.50	0.95	18	62	0.9	0.06	0.2	0.4	A1
29	780915	121	32.37	34-18.30	81-20.27	0.70	1.32	24	90	3.4	0.07	0.2	0.5	B1
30	780915	150	12.42	34-18.36	81-20.38	0.53	1.70	19	122	3.4	0.08	0.2	0.7	B1
31	780915	1228	1.65	34-18.27	81-20.17	0.44	2.05	13	89	3.5	0.05	0.2	1.8	A1
32	780915	1234	40.31	34-18.46	81-20.01	1.20	1.29	19	150	3.2	0.07	0.3	1.0	B1
33	780915	1442	0.18	34-18.45	81-20.15	0.25	1.02	15	194	3.3	0.07	0.3	0.5	C1
34	780915	1728	46.22	34-18.19	81-20.12	1.03	1.50	24	99	3.7	0.07	0.2	1.2	A1
35	780915	18 7	29.57	34-18.24	81-20.16	1.03	1.12	29	89	3.6	0.05	0.1	1.0	A1
36	780915	2140	7.58	34-18.21	81-20.18	1.13	1.18	24	90	3.6	0.06	0.1	1.1	B1
37	780915	2144	1.12	34-18.13	81-20.15	0.40	1.60	27	91	3.8	0.07	0.1	0.6	B1

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38	780915	2149	54.51	34-18.19	81-20.29	0.27	0.91	23	93	3.6	0.06	0.2	0.4	B1
39	780915	2249	31.96	34-19.41	81-20.19	1.00	1.21	24	87	3.3	0.07	0.2	1.4	A1
40	780915	2358	29.52	34-18.09	81-20.29	0.32	0.91	20	123	3.8	0.06	0.2	0.8	B1
41	781001	1524	3.30	34-21.21	81-20.98	1.12	0.91	16	96	2.1	0.08	0.2	1.4	B1
42	781002	622	9.60	34-18.37	81-20.35	1.67	1.02	18	121	3.3	0.07	0.2	0.6	B1
43	781002	727	18.83	34-19.77	81-19.77	1.98	1.09	19	74	2.7	0.09	0.3	0.7	A1
44	781002	823	11.33	34-23.01	81-18.38	0.71	0.57	11	183	2.2	0.08	0.3	0.8	C1
45	781003	939	4.33	34-18.23	81-20.18	1.84	2.25	11	119	4.2	0.06	0.3	1.4	B1
46	781003	1022	31.29	34-18.47	81-20.06	0.78	0.21	13	114	4.5	0.06	0.2	1.1	B1
47	781004	1011	53.11	34-20.43	81-19.92	0.17	1.02	14	82	1.9	0.09	0.3	0.7	A1
48	781005	5 6	56.33	34-18.42	81-20.55	0.83	1.02	15	93	4.5	0.06	0.2	68.7	C1
49	781006	550	28.07	34-22.98	81-18.30	0.92	1.64	15	131	5.7	0.09	0.3	13.2	C1
50	781006	833	47.21	34-23.29	81-18.33	0.84	0.82	16	138	6.3	0.08	0.3	95.4	C1
53	781012	210	19.34	0-19.66	81-19.92	0.84		14	120	2.4	0.06	0.2	2.0	B1
51	781012	7 3	31.14	34-19.65	81-18.77	0.35		17	77	2.5	0.09	0.3	0.7	A1
52	781012	7 5	1.66	34-20.28	81-19.41	2.72		7	110	1.3	0.09	0.8	1.0	B1
54	781013	514	47.17	34-19.56	81-18.70	0.46		16	78	5.1	0.06	0.2	0.8	B1
55	781013	520	31.76	34-19.57	81-18.68	1.69		17	78	2.7	0.09	0.2	0.9	A1
56	781013	548	17.08	34-19.62	81-18.71	1.54		16	78	5.0	0.06	0.2	1.2	A1
57	781013	632	36.64	34-19.54	81-18.66	0.32		17	78	2.7	0.09	0.2	0.7	A1
58	781013	751	27.00	34-19.36	81-18.73	0.33		10	116	2.9	0.07	0.3	0.8	B1
59	781013	10 9	31.11	34-19.78	81-18.71	1.59		14	84	2.5	0.07	0.2	0.6	A1
60	781016	18 6	52.36	34-20.65	81-20.16	0.27		17	64	0.9	0.09	0.2	0.6	A1
61	781016	2050	34.96	34-19.20	81-20.50	0.86		12	102	3.7	0.03	0.1	4.4	B1
62	781017	318	0.35	34-18.30	81-20.50	0.98		17	95	3.5	0.05	0.1	1.6	B1
63	781017	355	49.24	34-18.11	81-20.54	0.45		17	100	3.8	0.04	0.1	0.5	B1
64	781017	547	46.78	34-18.16	81-20.43	0.36		11	96	3.7	0.02	0.1	0.6	B1
65	781017	554	0.00	34-18.60	81-20.53	1.97		12	189	2.9	0.04	0.2	0.4	C1
66	781017	555	46.60	34-18.36	81-20.35	1.41		11	105	3.4	0.03	0.1	0.5	B1
67	781017	617	42.71	34-18.34	81-20.35	0.61		17	91	3.4	0.06	0.2	0.5	B1
68	781017	1026	11.24	34-20.61	81-19.18	1.84		14	104	1.8	0.21	0.7	1.8	B1
69	781017	1345	18.33	34-18.43	81-20.35	1.30		15	120	3.2	0.10	0.3	2.0	B1
70	781018	156	37.97	34-19.52	81-18.59	0.93		10	96	2.8	0.07	0.5	4.0	B1
71	781018	2355	40.25	34-18.44	81-20.35	0.74		14	120	3.2	0.08	0.3	0.8	B1
72	781020	810	24.93	34-19.86	81-20.64	1.00		17	66	0.8	0.07	0.2	0.7	A1
73	781020	2137	51.78	34-18.35	81-20.18	0.78		18	88	3.4	0.06	0.2	0.6	A1
74	781021	255	43.75	34-20.28	81-20.49	0.47		12	118	0.4	0.06	0.2	0.3	B1
75	781023	17 3	11.86	34-18.57	81-20.35	0.48		12	119	3.0	0.06	0.3	0.8	B1
76	781023	1757	15.15	34-20.13	81-16.88	1.99		16	96	5.2	0.07	0.2	1.0	B1
77	781023	19 2	48.29	34-18.55	81-20.35	0.55		18	87	3.0	0.05	0.1	0.5	A1

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78	781024	3 6	50.07	34-23.99	81-19.04	0.37	12	133	2.7	0.10	0.3	0.9	B1
79	781024	1836	48.00	34-20.15	81-19.82	0.30	11	68	0.7	0.08	0.4	0.9	A1
80	781025	111	14.57	34-23.21	81-18.16	0.05	8	160	2.7	0.07	0.5	1.0	B1
81	781025	1614	40.53	34-18.06	81-19.78	1.74	14	84	3.7	0.08	0.3	1.6	A1
82	781025	1835	47.45	34-25.36	81-24.07	0.0	8	235	1.7	0.05	0.7	0.1	C1
83	781027	726	2.40	34-17.95	81-20.29	0.20	9	98	3.5	0.02	0.1	0.3	B1
84	781027	1627	18.08	34-18.20	81-19.66	0.26	10	70	3.9	0.03	0.1	0.5	A1
85	781027	17 3	22.72	34-21.21	81-20.64	0.20	13	94	2.9	0.06	0.2	0.6	B1
86	781027	1933	16.77	34-18.12	81-19.64	1.77	14	100	3.9	0.09	0.3	1.2	B1
87	781027	2139	54.39	34-18.28	81-19.99	0.76	9	172	3.5	0.05	0.4	0.8	B1
88	781027	2142	53.19	34-20.44	81-20.08	0.59	13	95	3.4	0.05	0.2	0.8	B1
89	781028	358	39.73	34-18.03	81-19.58	1.00	8	184	4.1	0.06	0.5	3.8	C1
90	781028	1048	32.13	34-19.01	81-19.56	0.21	10	251	2.4	0.07	0.5	0.9	C1
91	781029	358	39.76	34-18.24	81-19.43	1.75	13	100	3.9	0.06	0.3	0.8	B1
92	781102	20 4	42.78	34-17.86	81-19.31	1.04	9	165	3.5	0.05	0.4	2.5	C1
93	781102	2158	32.34	34-17.73	81-19.30	0.95	7	160	3.3	0.03	0.2	2.4	C1
94	781104	639	28.67	34-18.17	81-19.47	1.67	7	153	3.9	0.05	0.4	1.1	B1
95	781104	2054	42.68	34-17.88	81-19.22	0.77	13	95	3.6	0.06	0.3	1.3	B1
96	781105	3 1	30.94	34-18.57	81-20.60	1.25	12	223	3.0	0.03	0.2	0.7	C1
97	781105	1646	52.11	34-18.22	81-19.01	0.45	11	137	3.7	0.05	0.3	1.2	B1
98	781105	2026	6.35	34-23.60	81-18.38	0.46	14	144	3.1	0.05	0.2	0.7	B1
99	781110	15 3	52.09	34-17.75	81-19.47	1.71	13	101	3.3	0.08	0.3	1.2	B1
100	781111	2131	42.23	34-23.41	81-19.26	1.54	12	142	2.2	0.08	0.4	1.0	B1
101	781113	1643	10.31	34-20.29	81-20.37	0.49	10	178	3.8	0.05	0.3	0.7	B1
102	781115	15 8	13.09	34-21.59	81-20.77	0.73	14	104	2.3	0.06	0.2	0.5	B1
103	781115	15 3	38.53	34-21.50	81-20.85	0.21	13	102	2.5	0.05	0.2	0.6	B1
104	781120	259	54.93	34-17.25	81-20.61	1.71	12	160	3.4	0.08	0.4	1.0	B1
105	781120	21 4	27.42	34-20.37	81-20.55	1.32	9	90	3.8	0.04	0.2	1.2	B1
106	781121	213	51.99	34-20.28	81-20.56	0.14	9	104	0.5	0.04	0.2	0.4	B1
107	781121	1137	28.34	34-21.65	81-20.91	0.37	9	141	2.4	0.04	0.2	0.5	B1
108	781122	21 6	15.41	34-17.91	81-20.32	0.71	18	99	3.5	0.07	0.2	0.8	B1
109	781122	2344	49.03	34-19.81	81-20.76	0.40	7	195	1.0	0.06	0.7	0.8	C1
110	781123	2119	44.59	34-20.38	81-20.46	0.63	14	63	0.5	0.07	0.2	0.4	A1
110A	781123	2141	25.04	34-20.28	81-20.44	0.26	15	102	0.3	0.07	0.2	0.4	B1
111	781124	1117	25.46	34-19.76	81-18.95	0.20	16	86	1.7	0.07	0.2	0.6	A1
112	781124	1118	11.21	34-20.01	81-18.91	0.12	14	98	1.8	0.06	0.2	0.6	B1
113	781124	1154	40.91	34-18.23	81-20.71	0.16	10	101	3.7	0.02	0.1	1.0	B1
114	781124	1158	54.07	34-18.44	81-20.77	1.65	19	96	3.3	0.09	0.2	0.8	B1
115	781124	1239	4.04	34-18.48	81-20.59	0.44	13	125	4.6	0.06	0.3	1.1	B1
116	781124	1241	21.48	34-18.19	81-20.71	1.14	18	102	3.7	0.06	0.2	1.5	B1

117	781124	1258	35.27	34-18.26	81-20.61	0.52	10	98	3.6	0.05	0.1	0.5	B1
118	781124	13 0	11.57	34-18.33	81-20.59	1.26	16	99	3.5	0.05	0.1	0.7	B1
119	781124	1344	3.43	34-18.14	81-20.75	0.12	10	104	3.8	0.02	0.1	1.2	B1
120	781124	1447	0.63	34-18.28	81-20.84	1.04	15	102	3.6	0.09	0.3	1.4	B1
121	781124	1519	15.40	34-18.30	81-20.81	0.32	15	100	3.6	0.04	0.1	0.5	B1
122	781125	926	10.07	34-20.28	81-20.22	0.40	13	83	0.2	0.08	0.3	0.4	A1
123	781125	3 0	10.69	34-20.28	81-20.75	0.41	6	220	0.8	0.04	1.4	0.9	C1
124	781125	321	3.00	34-20.28	81-20.35	0.02	13	107	0.2	0.63	2.1	0.6	C1
125	781125	321	10.68	34-18.89	81-19.92	3.73	9	189	2.7	0.37	2.7	3.5	D1
126	781125	626	40.25	34-18.38	81-21.43	1.03	8	229	3.8	0.07	0.9	1.4	C1
127	781125	1120	11.32	34-18.13	81-20.64	0.67	15	131	3.8	0.05	0.2	0.6	B1
128	781125	1120	42.97	34-18.14	81-20.14	0.05	14	111	3.8	0.07	0.3	1.0	B1
129	781125	1123	15.01	34-18.18	81-20.68	0.10	15	101	3.3	0.05	0.2	0.5	B1
130	781125	1758	35.93	34-20.20	81-20.63	0.70	15	66	0.6	0.06	0.2	0.3	A1
131	781126	541	15.79	34-20.05	81-20.01	0.70	15	84	0.2	0.06	0.2	0.3	A1
132	781128	1037	1.26	34-17.64	81-19.06	0.73	15	89	3.3	0.07	0.3	1.1	A1
133	781129	150	4.09	34-18.98	81-19.97	0.40	14	109	3.8	0.04	0.1	0.6	B1
134	781129	953	46.18	34-20.07	81-18.9[illegible]	0.28	13	93	1.9	0.07	0.2	0.5	B1
135	781129	1052	45.21	34-17.76	81-18.97	0.76	14	147	3.6	0.09	0.6	2.2	C1
136	781130	540	32.20	34-20.65	81-20.35	0.58	18	66	0.9	0.05	0.1	0.3	A1
137	781130	531	34.72	34-20.49	81-20.38	0.44	11	72	3.5	0.04	0.2	0.8	A1
138	781130	7 9	37.15	34-20.60	81-20.25	0.52	15	70	0.8	0.05	0.1	0.3	A1
139	781130	914	39.32	34-20.49	81-20.35	0.59	17	63	0.6	0.07	0.2	0.4	A1
140	781130	1418	3.93	34-18.75	81-19.75	1.28	13	115	2.8	0.08	0.3	1.8	B1
141	781130	1636	32.91	34-20.67	81-20.27	0.31	17	68	0.9	0.06	0.2	0.4	A1
142	781130	17 4	43.21	34-20.74	81-20.18	0.56	17	66	1.0	0.06	0.2	0.4	A1
143	781130	1738	11.80	34-20.65	81-20.18	0.42	18	69	0.9	0.04	0.1	0.2	A1
144	781201	255	24.62	34-20.62	81-20.40	0.35	12	110	0.8	0.03	0.1	0.3	B1
145	781203	213	34.07	34-20.73	81-20.09	0.48	9	105	1.0	0.06	0.3	0.9	B1
146	781203	1047	21.49	34-20.48	81-20.43	0.50	16	64	0.6	0.05	0.1	0.3	A1
147	781203	1112	31.39	34-20.48	81-20.47	1.00	14	101	0.7	0.05	0.2	0.3	B1
148	781203	1622	44.89	34-18.47	81-20.76	0.75	17	96	3.2	0.06	0.2	0.5	B1
149	781203	1649	40.09	34-19.87	81-19.79	0.59	14	108	1.6	0.04	0.1	0.3	B1
150	781204	131	8.62	34-19.90	81-18.95	0.46	14	105	1.7	0.05	0.2	0.8	B1
151	781204	356	28.19	34-19.87	81-18.71	0.19	16	107	1.6	0.07	0.2	0.5	B1
201	781205	338	33.02	34-20.48	81-20.59	0.66	17	66	0.8	0.07	0.2	0.4	A1
202	781205	820	47.83	34-20.62	81-20.35	0.53	17	65	0.8	0.06	0.2	0.4	A1
203	781206	156	10.57	34-20.38	81-20.74	1.00	18	66	0.8	0.08	0.2	0.5	A1
204	781206	533	55.12	34-20.43	81-20.67	1.00	18	66	0.8	0.06	0.2	0.4	A1

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205	781207	336	40.11	34-17.92	81-20.36	0.51	14	126	3.5	0.06	0.2	0.7	B1
206	781208	1423	14.93	34-21.55	81-20.80	1.67	15	104	2.3	0.07	0.2	0.7	B1
207	781211	1029	32.54	34-17.95	81-20.14	0.86	13	133	3.3	0.06	0.3	8.0	C1
208	781211	1439	14.59	34-18.07	81-20.72	0.97	16	134	3.0	0.10	0.3	3.5	B1
209	781212	4 5	53.50	34-18.62	81-19.71	0.61	12	117	3.0	0.04	0.2	0.6	B1
210	781212	557	51.29	34-20.28	81-20.61	0.45	10	169	0.6	0.06	0.4	0.6	B1
211	781212	723	51.57	34-20.29	81-18.73	0.34	15	80	1.7	0.07	0.2	0.6	A1
212	781212	931	13.31	34-20.75	81-20.49	0.28	9	71	1.1	0.03	0.2	0.5	A1
213	781213	129	1.32	34-20.36	81-20.72	0.50	15	77	1.4	0.08	0.2	0.8	A1
214	781213	333	16.54	34-20.75	81-20.62	0.59	16	99	1.2	0.07	0.2	0.6	B1
215	781213	1912	11.87	34-20.92	81-20.09	1.00	15	92	1.2	0.06	0.2	0.7	B1
216	781214	1112	53.13	34-20.80	81-20.12	0.34	12	65	1.2	0.03	0.1	0.3	A1
217	781215	322	3.41	34-20.81	81-20.16	0.77	15	66	2.8	0.05	0.1	0.5	A1
218	781217	338	31.66	34-18.68	81-19.59	1.04	16	119	2.9	0.09	0.3	1.0	B1
219	781217	9 5	47.73	34-18.74	81-19.67	1.63	17	116	2.8	0.07	0.2	0.7	B1
220	781220	2310	23.92	34-20.90	81-20.73	0.42	17	79	3.1	0.05	0.1	0.7	A1
221	781223	1447	24.70	34-20.03	81-20.43	0.43	13	104	4.1	0.05	0.2	0.7	B1
222	781223	1612	6.15	34-20.77	81-20.39	1.01	12	96	3.0	0.06	0.3	0.6	B1
223	781229	1211	17.57	34-21.54	81-20.06	1.12	14	86	1.5	0.05	0.2	0.5	A1

APPENDIX IX

FREE RADON IN WATER

Well #1

DATE	TIME (LOCAL)	pCi/L	REMARKS
Jan. 8, 1976		$<3.18 \times 10^3$	Duke
15		$<1.62 \times 10^3$	Duke
16		$<2.40 \times 10^3$	Duke
23		$4.24 \times 10^3 \pm 4.98 \times 10^2$	Duke
29		$<2.63 \times 10^3$	Duke
Feb. 5		$<3.80 \times 10^3$	Duke
12		$<5.32 \times 10^3$	Duke
	13:00	$1.40 \times 10^3 \pm 1.0 \times 10^2$	USC
19		$<3.9 \times 10^3$	Duke
	14:25	$1.20 \times 10^3 \pm 0.84 \times 10^2$	USC
26		$<1.1 \times 10^4$	Duke
	14:30	$1.02 \times 10^3 \pm 0.7 \times 10^2$	USC
Mar. 4	15:45	$1.19 \times 10^3 \pm 0.83 \times 10^2$	USC
		$<4.3 \times 10^3$	Duke
11		$<2.75 \times 10^3$	Duke
	14:30	$1.19 \times 10^3 \pm 0.83 \times 10^2$	USC
18		$5.4 \times 10^3 \pm 1.0 \times 10^3$	Duke
	14:40	$1.73 \times 10^3 \pm 1.20 \times 10^2$	USC
25		$2.3 \times 10^3 \pm 0.5 \times 10^3$	Duke
	14:00	$1.79 \times 10^3 \pm 1.25 \times 10^2$	USC
Apr. 16		$2.12 \times 10^3 \pm 6.14 \times 10^2$	Duke
22		$1.41 \times 10^3 \pm 6.03 \times 10^2$	Duke

DATE		TIME (LOCAL)	pCi/L	REMARKS
May	17, 1976	17:30	$1.44 \times 10^3 \pm 1.00 \times 10^2$	USC
	18	17:45	$1.58 \times 10^3 \pm 1.10 \times 10^2$	USC
	19	20:05	$1.39 \times 10^3 \pm 9.7 \times 10^1$	USC
	20	15:55	$1.46 \times 10^3 \pm 1.02 \times 10^2$	USC

Well #3

Jan.	8		$2.58 \times 10^4 \pm 1.60 \times 10^3$	Duke
	15		$2.20 \times 10^4 \pm 8.67 \times 10^2$	Duke
	16		$1.56 \times 10^4 \pm 1.13 \times 10^3$	Duke
	23		$2.01 \times 10^4 \pm 8.42 \times 10^2$	Duke
	29		$2.05 \times 10^4 \pm 1.33 \times 10^3$	Duke
Feb.	5		$2.46 \times 10^4 \pm 1.89 \times 10^3$	Duke
	12		$2.00 \times 10^4 \pm 2.33 \times 10^3$	Duke
		13:00	$2.07 \times 10^4 \pm 1.45 \times 10^3$	USC
	19		$2.15 \times 10^4 \pm 1.55 \times 10^3$	Duke
		14:17	$1.74 \times 10^4 \pm 1.22 \times 10^3$	USC
	20	13:50	$2.12 \times 10^4 \pm 1.48 \times 10^3$	USC
	21	13:30	$2.20 \times 10^4 \pm 1.54 \times 10^3$	USC
	22	13:00	$2.25 \times 10^4 \pm 1.57 \times 10^3$	USC
	23	13:30	$>1.82 \times 10^4 \pm 1.27 \times 10^3$	USC
	24	13:30	$2.26 \times 10^4 \pm 1.58 \times 10^4$	USC
	26		$4.2 \times 10^4 \pm 2.5 \times 10^3$	Duke
		14:30	$1.85 \times 10^4 \pm 1.30 \times 10^3$	USC
	27	14:38	$2.03 \times 10^4 \pm 1.40 \times 10^3$	USC
	29	14:30	$1.83 \times 10^4 \pm 1.28 \times 10^3$	USC

DATE		TIME (LOCAL)	pCi/L	REMARKS
Mar.	4		$2.15 \times 10^4 \pm 1.5 \times 10^3$	Duke
		16:00	$1.70 \times 10^4 \pm 1.19 \times 10^3$	USC
	5	16:15	$2.16 \times 10^4 \pm 1.51 \times 10^3$	USC
	6	18:30	$1.85 \times 10^4 \pm 1.30 \times 10^3$	USC
	7	11:00	$2.16 \times 10^4 \pm 1.51 \times 10^3$	USC
	9	18:15	$2.26 \times 10^4 \pm 1.58 \times 10^3$	USC
	10	17:35	$1.81 \times 10^4 \pm 1.27 \times 10^3$	USC
	11	14:25	$1.95 \times 10^4 \pm 1.36 \times 10^3$	USC
			$1.86 \times 10^4 \pm 1.2 \times 10^3$	Duke
	13	18:10	$2.09 \times 10^4 \pm 1.46 \times 10^3$	USC
	17	18:30	$1.73 \times 10^4 \pm 1.21 \times 10^3$	USC
	18		$2.38 \times 10^4 \pm 1.2 \times 10^3$	Duke
		14:30	$2.03 \times 10^4 \pm 1.42 \times 10^3$	USC
	20	17:10	$1.69 \times 10^4 \pm 1.19 \times 10^3$	USC
	21	13:35	$2.23 \times 10^4 \pm 1.56 \times 10^3$	USC
	23	19:15	$1.84 \times 10^4 \pm 1.28 \times 10^3$	USC
	24	18:45	$1.74 \times 10^4 \pm 1.22 \times 10^3$	USC
	25		$2.1 \times 10^4 \pm 1.0 \times 10^3$	Duke
		14:15	$2.27 \times 10^4 \pm 1.59 \times 10^3$	USC
	27	16:06	$2.35 \times 10^4 \pm 1.64 \times 10^3$	USC
	29	15:20	$2.23 \times 10^4 \pm 1.56 \times 10^3$	USC
	30	17:00	$2.11 \times 10^4 \pm 1.48 \times 10^3$	USC
	31	17:40	$1.99 \times 10^4 \pm 1.40 \times 10^3$	USC
Apr.	1	16:00	$2.22 \times 10^4 \pm 1.55 \times 10^3$	USC
	2	16:05	$2.08 \times 10^4 \pm 1.46 \times 10^3$	USC

Well #3

DATE		TIME (LOCAL)	pCi/L	REMARKS
Apr.	3	15:00	$2.16 \times 10^4 \pm 1.51 \times 10^3$	USC
	4	15:15	$1.95 \times 10^4 \pm 1.36 \times 10^3$	USC
	5	14:40	$>1.78 \times 10^4 \pm 1.25 \times 10^3$	USC
	6	15:00	$1.63 \times 10^4 \pm 1.14 \times 10^3$	USC
	7	16:30	$1.90 \times 10^4 \pm 1.33 \times 10^3$	USC
	10	17:06	$2.01 \times 10^4 \pm 1.41 \times 10^3$	USC
	12	16:30	$>1.49 \times 10^4 \pm 1.04 \times 10^3$	USC
	13	15:05	$2.29 \times 10^4 \pm 1.60 \times 10^3$	USC
	14	15:45	$1.19 \times 10^4 \pm 8.33 \times 10^2$	USC
	16	15:25	$2.18 \times 10^4 \pm 1.52 \times 10^3$	USC
			$2.59 \times 10^4 \pm 1.98 \times 10^3$	Duke
	20	15:10	$>1.84 \times 10^4 \pm 1.29 \times 10^3$	USC
	21	15:10	$>1.77 \times 10^4 \pm 1.24 \times 10^3$	USC
	22	15:20	$2.18 \times 10^4 \pm 1.52 \times 10^3$	USC
			$2.65 \times 10^4 \pm 1.84 \times 10^3$	Duke
	23	14:25	$1.97 \times 10^4 \pm 1.39 \times 10^3$	USC
	24	15:30	$1.79 \times 10^4 \pm 1.25 \times 10^3$	USC
	25	15:43	$1.19 \times 10^4 \pm 8.36 \times 10^2$	USC
	26	14:05	$1.57 \times 10^4 \pm 1.10 \times 10^3$	USC
	27	16:35	$> 1.63 \times 10^4 \pm 1.14 \times 10^3$	USC
	28	14:55	$1.93 \times 10^4 \pm 1.35 \times 10^3$	USC
	29	14:50	$> 1.31 \times 10^4 \pm 9.17 \times 10^2$	USC
May	1	17:30	$2.19 \times 10^4 \pm 1.54 \times 10^3$	USC
	2	10:30	$1.81 \times 10^4 \pm 1.27 \times 10^3$	USC

Well #3

DATE		TIME (LOCAL)	pCi/L	REMARKS
May	2	18:13	$1.99 \times 10^4 \pm 1.40 \times 10^3$	USC
	3	15:00	$1.12 \times 10^4 \pm 7.85 \times 10^2$	USC
	4	15:00	$1.71 \times 10^4 \pm 1.20 \times 10^3$	USC
	5	15:16	$1.59 \times 10^4 \pm 1.12 \times 10^3$	USC
	6	15:30	$1.86 \times 10^4 \pm 1.30 \times 10^3$	USC
	7	16:10	$1.26 \times 10^4 \pm 8.81 \times 10^2$	USC
	8	17:40	$1.94 \times 10^4 \pm 1.36 \times 10^3$	USC
	9	13:06	$1.94 \times 10^4 \pm 1.36 \times 10^3$	USC
	16	17:00	$1.60 \times 10^4 \pm 1.12 \times 10^3$	USC
	17	17:40	$1.49 \times 10^4 \pm 1.05 \times 10^3$	USC
	18	17:50	$2.36 \times 10^4 \pm 1.65 \times 10^3$	USC
	19	20:15	$1.81 \times 10^4 \pm 1.26 \times 10^3$	USC
	20	14:45	$1.49 \times 10^4 \pm 1.04 \times 10^3$	USC
	21	18:10	$1.73 \times 10^4 \pm 1.21 \times 10^3$	USC
	23	20:15	$2.00 \times 10^4 \pm 1.40 \times 10^3$	USC
	24	17:40	$1.49 \times 10^4 \pm 1.04 \times 10^3$	USC
	25	17:40	$1.61 \times 10^4 \pm 1.12 \times 10^3$	USC
	26	18:00	$2.14 \times 10^4 \pm 1.50 \times 10^3$	USC
	31	20:30	$2.01 \times 10^4 \pm 1.41 \times 10^3$	USC
June	2	17:00	$1.30 \times 10^4 \pm 9.1 \times 10^2$	USC
	3	12:00	$\geq 2.31 \times 10^4$	USC
	5	19:00	$2.49 \times 10^4 \pm 1.75 \times 10^3$	
	6	21:00	$1.22 \times 10^4 \pm 8.6 \times 10^2$	
	7	20:00	$2.26 \times 10^4 \pm 1.58 \times 10^3$	

Well #3

DATE		TIME (LOCAL)	pCi/L	REMARKS
June	11	18:30	$1.77 \times 10^4 \pm 1.24 \times 10^3$	
	13	18:00	$1.86 \times 10^4 \pm 1.30 \times 10^3$	
	14	20:35	$1.96 \times 10^4 \pm 1.37 \times 10^3$	
	16	18:30	$1.38 \times 10^4 \pm 2.23 \times 10^3$	
	18	17:00	$2.23 \times 10^4 \pm 1.56 \times 10^3$	
	20	19:00	$1.86 \times 10^4 \pm 1.30 \times 10^3$	
	22	18:00	$1.94 \times 10^4 \pm 1.36 \times 10^3$	
	28	21:00	$1.43 \times 10^4 \pm 1.00 \times 10^3$	
July	8	14:15	$2.53 \times 10^4 \pm 1.77 \times 10^3$	
	13	15:40	$1.84 \times 10^4 \pm 1.29 \times 10^3$	
	15	12:45	$2.40 \times 10^4 \pm 1.68 \times 10^3$	
	22	13:15	$2.28 \times 10^4 \pm 1.60 \times 10^3$	
	30	13:30	$2.70 \times 10^4 \pm 1.89 \times 10^3$	
Aug.	5	13:15	$2.66 \times 10^4 \pm 1.87 \times 10^3$	
	13	13:15	$2.64 \times 10^4 \pm 1.84 \times 10^3$	
	19	13:15	$2.21 \times 10^4 \pm 1.55 \times 10^3$	
	27	12:15	$2.82 \times 10^4 \pm 1.97 \times 10^3$	
Sept.	2	14:45	$1.72 \times 10^4 \pm 1.20 \times 10^3$	
	10	13:15	$1.94 \times 10^4 \pm 1.36 \times 10^3$	
	16	15:15	$1.15 \times 10^4 \pm 8.0 \times 10^2$	
	24	13:30	$1.59 \times 10^4 \pm 1.10 \times 10^3$	
Oct.	8	13:16	$2.40 \times 10^4 \pm 1.70 \times 10^3$	
Nov.	4	15:00	1.77×10^4	
Dec.	7	16:00(?)	$2.60 \times 10^4 \pm 1.82 \times 10^3$	
	15	16:00	$2.01 \times 10^4 \pm 1.41 \times 10^3$	

DATE	TIME (LOCAL)	pCi/L	REMARKS
Feb. 23, 1977	16:00	$1.88 \times 10^4 \pm 1.32 \times 10^3$	

Radon Concentration in Well #3

Mar. 8	1730	$1.32 \times 10^4 \pm 9.2 \times 10^2$	
23	1700 (?)	$2.08 \times 10^4 \pm 1.4 \times 10^3$	
Apr. 13	1535	$1.41 \times 10^4 \pm 9.9 \times 10^2$	
30	1215	$1.78 \times 10^4 \pm 1.24 \times 10^3$	
May 20	1440	$1.98 \times 10^4 \pm 1.38 \times 10^3$	
28	1520	$1.75 \times 10^4 \pm 1.23 \times 10^3$	
JUNE 12	1905	$1.73 \times 10^4 \pm 1.2 \times 10^3$	
25	1000	$8.36 \times 10^3 \pm 5.8 \times 10^2$	
JULY 2	1530	$2.45 \times 10^4 \pm 1.7 \times 10^3$	
17	1815	$1.64 \times 10^4 \pm 1.1 \times 10^3$	
19	1635	$1.72 \times 10^4 \pm 1.2 \times 10^3$	
20	1450	$1.53 \times 10^4 \pm 1.1 \times 10^3$	
AUGUST 19	1215	$3.54 \times 10^4 \pm 2.5 \times 10^3$	
SEPTEMBER 13	1100	$1.04 \times 10^4 \pm 7.6 \times 10^2$	
16	1115	$1.37 \times 10^4 \pm 9.6 \times 10^2$	

Well #4

Feb.	27, 1976	14:50	$1.44 \times 10^4 \pm 1.0 \times 10^3$	USC
Mar.	4	16:15	$8.13 \times 10^3 \pm 5.7 \times 10^2$	USC
	12	17:15	$1.55 \times 10^4 \pm 1.1 \times 10^3$	USC
	21	13:45	$> 5.92 \times 10^3$	USC
	26	13:45	$1.97 \times 10^4 \pm 1.4 \times 10^3$	USC
May	18	18:00(?)	$7.26 \times 10^3 \pm 7.2 \times 10^2$	
	31	20:30	$1.01 \times 10^4 \pm 7.0 \times 10^2$	
Sept.	8	18:00	$2.11 \times 10^4 \pm 1.48 \times 10^3$	
Feb.	12, 1977	16:15	$1.23 \times 10^4 \pm 8.6 \times 10^2$	

WELL #4

AUGUST	5	1830	$5.11 \times 10^3 \pm 3.6 \times 10^2$
SEPTEMBER	7	1900	$1.28 \times 10^4 \pm 8.9 \times 10^2$

Spring

May	19, 1976	20:50	$5.58 \times 10^3 \pm 3.9 \times 10^2$
	31	20:00	$4.90 \times 10^3 \pm 3.4 \times 10^2$
June	2	17:30	$5.54 \times 10^3 \pm 3.9 \times 10^2$
	3	09:00	$8.39 \times 10^3 \pm 5.9 \times 10^2$
		21:00	$6.14 \times 10^3 \pm 4.3 \times 10^2$
	4	11:00	5.61×10^3
	5	19:00	$5.10 \times 10^3 \pm 3.6 \times 10^2$
	6	20:00	$3.77 \times 10^3 \pm 2.6 \times 10^2$
	7	17:00	$4.92 \times 10^3 \pm 3.4 \times 10^2$
	8	22:00	$5.44 \times 10^3 \pm 3.8 \times 10^2$
	9	14:00	$5.07 \times 10^3 \pm 3.5 \times 10^2$

DATE	TIME (LOCAL)	pCi/L	REMARKS
		<u>Spring</u>	
June 10	13:00	$5.08 \times 10^3 \pm 3.6 \times 10^2$	
11	20:15	$5.06 \times 10^3 \pm 3.5 \times 10^2$	
12	18:10	$5.16 \times 10^3 \pm 3.6 \times 10^2$	
13	13:20	$4.76 \times 10^3 \pm 3.4 \times 10^2$	
	19:20	$4.95 \times 10^3 \pm 3.5 \times 10^2$	
14	10:00	$5.02 \times 10^3 \pm 3.5 \times 10^2$	
	20:20	$4.75 \times 10^3 \pm 3.3 \times 10^2$	
15	21:00	$4.77 \times 10^3 \pm 3.3 \times 10^2$	
16	20:30	$5.06 \times 10^3 \pm 3.5 \times 10^2$	
17	20:15	$3.83 \times 10^3 \pm 2.7 \times 10^2$	
18	16:30	$5.41 \times 10^3 \pm 3.8 \times 10^2$	
20	19:15	$4.23 \times 10^3 \pm 3.0 \times 10^2$	
21	18:30	$4.78 \times 10^3 \pm 3.4 \times 10^2$	
22	17:00	$6.84 \times 10^3 \pm 4.8 \times 10^2$	
23	17:30	$3.16 \times 10^3 \pm 2.2 \times 10^2$	
24	17:45	$5.01 \times 10^3 \pm 3.5 \times 10^2$	
26	18:00	$5.36 \times 10^3 \pm 3.8 \times 10^2$	
27	20:00	$4.71 \times 10^3 \pm 3.3 \times 10^2$	
28	20:45	$4.66 \times 10^3 \pm 3.3 \times 10^2$	
29	19:00	$4.67 \times 10^3 \pm 3.3 \times 10^2$	
July 8	14:15	5.06×10^3	
13	15:30	5.22×10^3	
16	13:15	$4.93 \times 10^3 \pm 3.4 \times 10^2$	
18	11:30	$5.01 \times 10^3 \pm 3.5 \times 10^2$	
20	13:30	$4.87 \times 10^3 \pm 3.4 \times 10^2$	

DATE	TIME (LOCAL)	pCi/L	REMARKS
		Spring	
July 22, 1976	13:30	$4.60 \times 10^3 \pm 3.2 \times 10^2$	
24	10:30	$5.23 \times 10^3 \pm 3.6 \times 10^2$	
26	13:30	5.07×10^3	
28	13:30	$5.23 \times 10^3 \pm 3.6 \times 10^2$	
30	13:15	$5.18 \times 10^3 \pm 3.6 \times 10^2$	
Aug. 1	10:45	$5.35 \times 10^3 \pm 3.7 \times 10^2$	
3	13:30	$5.23 \times 10^3 \pm 3.7 \times 10^2$	
5	13:00	$5.02 \times 10^3 \pm 3.5 \times 10^2$	
9	14:15	$4.33 \times 10^3 \pm 3.1 \times 10^2$	
11	13:15	$4.65 \times 10^3 \pm 3.2 \times 10^2$	
13	13:30	$5.43 \times 10^3 \pm 3.8 \times 10^2$	
15	10:54	$5.49 \times 10^3 \pm 3.8 \times 10^2$	
17	12:45	$4.80 \times 10^3 \pm 3.4 \times 10^2$	
19	13:30	$4.54 \times 10^3 \pm 3.2 \times 10^2$	
23	14:30	$4.46 \times 10^3 \pm 3.1 \times 10^2$	
25	13:15	$4.96 \times 10^3 \pm 3.5 \times 10^2$	
27	12:15	$4.11 \times 10^3 \pm 2.9 \times 10^2$	
31	12:30	$5.85 \times 10^3 \pm 4.1 \times 10^2$	
Sept. 2	13:15	$4.84 \times 10^3 \pm 3.4 \times 10^2$	
6	10:30	$4.25 \times 10^3 \pm 3.0 \times 10^2$	
8	12:30	$3.41 \times 10^3 \pm 2.4 \times 10^2$	
9	11:00	$3.29 \times 10^3 \pm 2.3 \times 10^2$	
10	13:30	$2.64 \times 10^3 \pm 1.8 \times 10^2$	
14	12:45	$2.85 \times 10^3 \pm 2.0 \times 10^2$	
16	16:30	$2.14 \times 10^3 \pm 1.5 \times 10^2$	

DATE	TIME (LOCAL)	pCi/L	REMARKS
		Spring	
Sept. 20, 1976	13:00(?)	$2.54 \times 10^3 \pm 1.8 \times 10^2$	
	13:15	$2.18 \times 10^3 \pm 1.5 \times 10^2$	
22	12:45	$2.80 \times 10^3 \pm 1.9 \times 10^2$	
24	13:45	$2.46 \times 10^3 \pm 1.7 \times 10^2$	
26	11:15	$3.53 \times 10^3 \pm 2.5 \times 10^2$	
28	14:15	$2.65 \times 10^3 \pm 1.8 \times 10^2$	
Oct. 2	12:00(?)	3.7×10^3	
6	14:30	4.6×10^3	
8	13:30	1.94×10^3	
10	10:30	$3.48 \times 10^3 \pm 2.4 \times 10^2$	
12	15:45	$4.54 \times 10^3 \pm 3.2 \times 10^2$	
18	14:30	$3.70 \times 10^3 \pm 2.6 \times 10^2$	
20	13:00	$4.64 \times 10^3 \pm 3.3 \times 10^2$	
23	10:00	$4.14 \times 10^3 \pm 2.9 \times 10^2$	
26	13:00	$3.61 \times 10^3 \pm 2.5 \times 10^2$	
29	14:15	$3.40 \times 10^3 \pm 2.4 \times 10^2$	
Nov. 1	16:20	$5.80 \times 10^3 \pm 4.1 \times 10^2$	
3	15:00	$6.09 \times 10^3 \pm 4.3 \times 10^2$	
5	13:30	$5.40 \times 10^3 \pm 3.8 \times 10^2$	
7	15:00	$3.45 \times 10^3 \pm 2.4 \times 10^2$	
9	12:00	$4.75 \times 10^3 \pm 3.3 \times 10^2$	
11	14:30	$5.92 \times 10^3 \pm 4.2 \times 10^2$	
12	23:30	$7.09 \times 10^3 \pm 5.0 \times 10^2$	
13	08:09	$5.33 \times 10^3 \pm 3.7 \times 10^2$	
16	16:30	$3.54 \times 10^3 \pm 2.5 \times 10^2$	

DATE	TIME (LOCAL)	pCi/L	REMARKS
		Spring	
Nov. 18, 1976	15:30	$3.73 \times 10^3 \pm 2.6 \times 10^2$	
19	16:30	$3.48 \times 10^3 \pm 2.4 \times 10^2$	
	20:15	$6.16 \times 10^3 \pm 4.3 \times 10^2$	
20	07:30	$6.68 \times 10^3 \pm 4.7 \times 10^2$	
21	13:00	$4.80 \times 10^3 \pm 3.4 \times 10^2$	
23	08:00	$6.33 \times 10^3 \pm 4.4 \times 10^2$	
25	19:00	$4.73 \times 10^3 \pm 3.3 \times 10^2$	
26	10:00	$5.71 \times 10^3 \pm 4.0 \times 10^2$	
27	14:45	$5.32 \times 10^3 \pm 3.7 \times 10^2$	
29	13:15	$2.68 \times 10^3 \pm 1.9 \times 10^2$	
Dec. 1	16:20	$5.44 \times 10^3 \pm 3.8 \times 10^2$	
3	16:10	$4.82 \times 10^3 \pm 3.4 \times 10^2$	
5	15:40	$3.58 \times 10^3 \pm 2.5 \times 10^2$	
7	16:15	$3.03 \times 10^3 \pm 2.1 \times 10^2$	
9	16:45	$5.56 \times 10^3 \pm 3.9 \times 10^2$	
11	13:10	$3.31 \times 10^3 \pm 2.3 \times 10^2$	
13	16:30	$3.91 \times 10^3 \pm 2.7 \times 10^2$	
15	16:00	$2.68 \times 10^3 \pm 1.9 \times 10^2$	
17	16:20	$4.42 \times 10^3 \pm 3.1 \times 10^2$	
19	17:00	$2.89 \times 10^3 \pm 2.0 \times 10^2$	
21	15:00	$5.22 \times 10^3 \pm 3.6 \times 10^2$	
23	18:00	$4.05 \times 10^3 \pm 2.8 \times 10^2$	
26	16:25	$5.62 \times 10^3 \pm 3.9 \times 10^2$	
28	17:00	$5.42 \times 10^3 \pm 3.8 \times 10^2$	

DATE	TIME (LOCAL)	pCi/L	REMARKS
		Spring	
Jan. 5, 1977	11:[illegible]	$5.28 \times 10^3 \pm 3.7 \times 10^2$	
14	18:[illegible]	$2.63 \times 10^3 \pm 1.8 \times 10^2$	
17	18:[illegible]	$5.91 \times 10^3 \pm 4.1 \times 10^2$	
18	17:[illegible]	$3.19 \times 10^3 \pm 2.2 \times 10^2$	
19	18:[illegible]	$5.85 \times 10^3 \pm 4.1 \times 10^2$	
20	18:[illegible]	$4.15 \times 10^3 \pm 2.9 \times 10^2$	
27	18:[illegible]	$5.89 \times 10^3 \pm 4.1 \times 10^2$	
Feb. 3	17:[illegible]	$4.67 \times 10^3 \pm 3.3 \times 10^2$	
5	16:[illegible]	$4.60 \times 10^3 \pm 3.2 \times 10^2$	
8	18:[illegible]	$5.75 \times 10^3 \pm 4.0 \times 10^2$	
9	17:[illegible]	$5.97 \times 10^3 \pm 4.2 \times 10^2$	
10	17:[illegible]	$5.93 \times 10^3 \pm 4.2 \times 10^2$	
12	15:[illegible]	$2.93 \times 10^3 \pm 2.1 \times 10^2$	
15	12:[illegible]	$2.89 \times 10^3 \pm 2.0 \times 10^2$	
16	21:[illegible]	$6.17 \times 10^3 \pm 3.4 \times 10^2$	
18	13:[illegible]	$3.61 \times 10^3 \pm 2.5 \times 10^2$	
20	18:10	$3.94 \times 10^3 \pm 2.7 \times 10^2$	
21	16:[illegible]	$5.81 \times 10^3 \pm 4.1 \times 10^2$	
22	18:45	$6.16 \times 10^3 \pm 4.3 \times 10^2$	
23	14:10	$4.85 \times 10^3 \pm 3.4 \times 10^2$	
24	15:45	$5.64 \times 10^3 \pm 3.9 \times 10^2$	
25	12:15	$3.59 \times 10^3 \pm 2.5 \times 10^2$	
26	15:15	$3.92 \times 10^3 \pm 2.7 \times 10^2$	

Spring

Date (1977)	Time (local)	pCi/L
Mar. 2	1330	$6.01 \times 10^3 \pm 4.2 \times 10^2$
4	1745	$5.99 \times 10^3 \pm 4.2 \times 10^2$
6	1300	$3.38 \times 10^3 \pm 2.4 \times 10^2$
8	1200	$5.66 \times 10^3 \pm 4.0 \times 10^2$
10	1200	$6.00 \times 10^3 \pm 4.2 \times 10^2$
17	1620	$6.24 \times 10^3 \pm 4.4 \times 10^2$
20	1830	$5.69 \times 10^3 \pm 4.0 \times 10^2$
23	0850 (?)	$6.71 \times 10^3 \pm 4.7 \times 10^2$
25	1510	$6.01 \times 10^3 \pm 4.2 \times 10^2$
27	1905	$6.16 \times 10^3 \pm 4.3 \times 10^2$
30	1130	$2.19 \times 10^3 \pm 1.5 \times 10^2$
Apr. 2	1800	$5.03 \times 10^3 \pm 3.5 \times 10^2$
5	1055	$3.52 \times 10^3 \pm 2.5 \times 10^2$
7	1225	$6.10 \times 10^3 \pm 4.3 \times 10^2$
13	1550	$5.36 \times 10^3 \pm 3.7 \times 10^2$
18	1125	$5.94 \times 10^3 \pm 4.2 \times 10^2$
22	1305	$5.51 \times 10^3 \pm 3.9 \times 10^2$
24	1600	$4.11 \times 10^3 \pm 2.9 \times 10^2$
26	1625	$5.21 \times 10^3 \pm 3.6 \times 10^2$
28	1810	$4.86 \times 10^3 \pm 3.4 \times 10^2$
30	1200	$4.68 \times 10^3 \pm 3.3 \times 10^2$
May 2	1610	$6.08 \times 10^3 \pm 4.2 \times 10^2$
4	1115	$5.86 \times 10^3 \pm 4.1 \times 10^2$

Spring

Date (1977)	Time (local)	pCi/L
May 6	1040	$3.91 \times 10^3 \pm 2.7 \times 10^2$
8	1830	$5.74 \times 10^3 \pm 4.0 \times 10^2$
10	1940	$4.68 \times 10^3 \pm 3.3 \times 10^2$
13	1900	$5.57 \times 10^3 \pm 3.9 \times 10^2$
20	1430	$3.92 \times 10^3 \pm 2.7 \times 10^2$
24	1230	$5.68 \times 10^3 \pm 4.0 \times 10^2$
28	1500	$4.81 \times 10^3 \pm 3.4 \times 10^2$
JUNE 1	1530	$5.41 \times 10^3 \pm 3.8 \times 10^2$
2	1700	$4.96 \times 10^3 \pm 3.5 \times 10^2$
3	1220	$5.60 \times 10^3 \pm 3.9 \times 10^2$
4	1145	$5.19 \times 10^3 \pm 3.6 \times 10^2$
7	1845	$6.14 \times 10^3 \pm 4.3 \times 10^2$
9	1550	$5.68 \times 10^3 \pm 4.0 \times 10^2$
12	1910	$6.40 \times 10^3 \pm 4.5 \times 10^2$
16	1630	$4.60 \times 10^3 \pm 3.2 \times 10^2$
18	1500	$3.39 \times 10^3 \pm 2.4 \times 10^2$
21	1710	$3.92 \times 10^3 \pm 2.7 \times 10^2$
23	1230	$4.92 \times 10^3 \pm 3.4 \times 10^2$
25	1045	$5.22 \times 10^3 \pm 3.7 \times 10^2$
26	1400	$5.11 \times 10^3 \pm 3.6 \times 10^2$
28	2000	$4.16 \times 10^3 \pm 2.9 \times 10^2$
29	1230	$5.13 \times 10^3 \pm 3.6 \times 10^2$
30	1800	$5.68 \times 10^3 \pm 4.0 \times 10^2$

RADON CONCENTRATION IN SPRING

DATE (1977)	TIME	pCi/L	
JULY 3	1530	$3.39 \times 10^3 \pm 2.4 \times 10^2$	
6	1230	$6.15 \times 10^3 \pm 4.3 \times 10^2$	
7	1800	$5.16 \times 10^3 \pm 3.6 \times 10^2$	
9	1220	$5.27 \times 10^3 \pm 3.7 \times 10^2$	
11	1900	$4.05 \times 10^3 \pm 2.8 \times 10^2$	
15	1900	$5.83 \times 10^3 \pm 4.1 \times 10^2$	
17	1840	$5.15 \times 10^3 \pm 3.6 \times 10^2$	
19	1620	$4.55 \times 10^3 \pm 3.2 \times 10^2$	
20	1520	$5.60 \times 10^3 \pm 3.9 \times 10^2$	
21	1525	$3.71 \times 10^3 \pm 2.6 \times 10^2$	
22	1915	$7.34 \times 10^3 \pm 5.1 \times 10^2$	
27	1245	$4.41 \times 10^3 \pm 3.1 \times 10^2$	
28	1730	$2.94 \times 10^3 \pm 2.0 \times 10^2$	
AUGUST 1	1330	4.12×10^2	leakage
5	1530	$5.17 \times 10^3 \pm 3.6 \times 10^2$	
5	1800	$4.37 \times 10^3 \pm 3.1 \times 10^2$	
7	1420	$2.61 \times 10^3 \pm 1.8 \times 10^2$	
8	1115	$3.95 \times 10^3 \pm 2.8 \times 10^2$	
10	1130	$3.46 \times 10^3 \pm 2.4 \times 10^2$	
11	1210	$2.76 \times 10^3 \pm 1.9 \times 10^2$	
13	1400	$3.58 \times 10^3 \pm 2.5 \times 10^2$	
16	1810	$3.12 \times 10^3 \pm 2.2 \times 10^2$	
21	1730	$4.12 \times 10^3 \pm 2.9 \times 10^2$	
23	1100	$4.66 \times 10^3 \pm 3.3 \times 10^2$	
24	1138	$5.28 \times 10^3 \pm 3.7 \times 10^2$	

Spring

	DATE (1977)	TIME	pCi/L	
August	25	1230	$2.67 \times 10^3 \pm 1.9 \times 10^2$	
	26	1150	5.36×10^2	Leakage
	27	0930	$4.95 \times 10^3 \pm 3.5 \times 10^2$	
	30	1630	6.66×10^2	Leakage
September	2	1430	$2.50 \times 10^3 \pm 1.7 \times 10^2$	
	5	1900	2.98×10^2	Leakage
	7	1125	$5.10 \times 10^3 \pm 3.6 \times 10^2$	
	8	1725	$4.34 \times 10^3 \pm 3.0 \times 10^2$	
	9	1130	1.02×10	Leakage
	10	0945	$4.59 \times 10^3 \pm 3.2 \times 10^2$	
	12	1500	2.1×10	leakage
	14	1110	$2.13 \times 10^3 \pm 1.5 \times 10^2$	
	16	1850	$2.16 \times 10^3 \pm 1.5 \times 10^2$	
	17	1630	1.35×10^2	Leakage
	21	1222	1.05×10^2	Leakage
	25	1245	$4.93 \times 10^3 \pm 3.4 \times 10^2$	
	27	1130	6.9×10	Leakage
	29	1645	$5.64 \times 10^3 \pm 3.9 \times 10^2$	

Spring

DATE	LOCAL TIME	pCi/L	REMARKS
1977 October 23	1345	$4.44 \times 10^3 \pm 3.1 \times 10^2$	
26	1215	$3.40 \times 10^3 \pm 2.4 \times 10^2$	
28	1110	$4.02 \times 10^3 \pm 2.8 \times 10^2$	
31	1715	$5.77 \times 10^3 \pm 4.0 \times 10^2$	
November 3	1120	$5.45 \times 10^3 \pm 3.8 \times 10^2$	
6	1520	1.49×10^3	Fluid Water Stack
9	1115	$5.72 \times 10^3 \pm 4.0 \times 10^2$	
11	1045	$3.76 \times 10^3 \pm 2.6 \times 10^2$	
12	1630	$3.87 \times 10^3 \pm 2.7 \times 10^2$	
16	1100	$5.28 \times 10^3 \pm 3.7 \times 10^2$	
30	1145	$4.47 \times 10^3 \pm 3.1 \times 10^2$	
December 2	1400	$5.71 \times 10^3 \pm 4.0 \times 10^2$	
6	1100	$5.84 \times 10^3 \pm 4.1 \times 10^2$	
8	1130	$5.70 \times 10^3 \pm 4.0 \times 10^2$	
11	1720	$6.36 \times 10^3 \pm 4.5 \times 10^2$	
18	1430	$5.64 \times 10^3 \pm 3.9 \times 10^2$	
21	1110	$5.83 \times 10^3 \pm 4.1 \times 10^2$	
23	1115	$5.61 \times 10^3 \pm 3.9 \times 10^2$	
30	1130	$7.05 \times 10^3 \pm 4.9 \times 10^2$	

RADON, ALKALINITY, CONDUCTIVITY AND CHLORINITY
OF SPRING WATER SAMPLES

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity µMHO/cm	Alkalinity ppm	Remarks
1978 February	14	1100	6235.18	16.41	24.0		
	16	1100	5252.27	19.36	20.5		
	20	1115	4886.93	20.01	19.0		
	26	1400	5396.12	17.51	20.5		
March	10	1100	2528.67	15.37	14.0		
	12	1300	4509.50	15.52	20.0		
	16	1600	4272.69	15.78	23.0		
	22	1100	6328.22	15.89	23.5		
	24	1740	5396.82	14.65	20.5		
	29	1800	4730.35	14.75	22.5		Leakage
April	03	1430	5105.23	25.27	24.0		
	05	1500	6008.52	22.15	22.0		
	07	1500	5322.61	22.51	22.5		
	09	1130	5354.89	22.37	22.0		
	11	0815	5397.42	24.50	24.0		
	13	0815	5653.33	24.89	24.0		
	15	0815	5394.95	23.35	23.5		
	17	0815	5763.36	39.05	160.0		
	19	0845	4825.54	19.91	27.0		
	25	1500	4868.10	21.06	27.5		
	27	0800	5264.64	20.29	25.5		

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity μMHO/cm	Alkalinity ppm	Remarks
April	29	0815	5297.63	22.21	28.0		
May	01	1500	5513.52	21.44	25.0		
	03	1230	5101.06	23.74	25.5		
	06	1630	3658.29	15.95	26.1	4.92	
	09	0745	1933.05	17.73	23.5	2.92	
	11	1700	2722.80	17.02	24.5	4.92	
	14	2045	3770.97	17.54	26.5	5.58	
	17	1845	3807.70	23.00	30.5	9.51	
	19	0805	4242.40	26.58	25.0	5.83	
	21	1500	3479.50	17.73	28.0	7.76	
	25	1400	0435.64	13.30	35.5		
	30	1200	1097.20	12.41	26.5		
June	01	1130	2356.55	14.18	25.5		
	03	1245	4674.45	13.30	26.5		
	05	1425	4413.12	19.50	28.0	6.56	
	06	1030	0714.50	10.98	28.0	5.15	
	08	1545	1288.30	11.34	26.0	7.11	
	10	1015	1016.07	10.28	25.0	7.33	
	13	1630	0829.52	14.18	26.0	6.89	
	15	1915	1223.21	12.76	26.5	7.11	
	17	1630	2572.01				
	25	1730	0655.60	12.78	30.5	11.48	
	27	1230	1973.42	12.05	26.5	6.56	
	29	1900	4708.40	12.78	27.0	7.11	

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity µMHO/cm	Alkalinity ppm	Remarks
July	01	1830	3002.97	12.78	26.3	3.64	
	03	2000	7509.04	14.18	25.0	4.56	
	05	1100	3884.11	11.34	25.8	5.47	
	08	2030	2388.64	13.59	40.0	5.47	
	10	1115	5086.65	13.59	32.5	5.28	
	12	1100	5377.60	05.67	29.0	5.28	
	14	1630	4677.72	05.67	28.5	4.92	
	16	1030	2351.48	05.67	31.0	4.92	
	18	0830	5187.41	03.55	31.0	5.08	
	19	1900	5208.56	04.14	30.0	4.92	
	21	2015	3912.46		28.5	5.90	
	26	1700	2578.36		28.8	5.08	
	28	1530	2792.79		28.5	5.25	
	30	1515	4947.33		28.5	5.08	
August	01	1615	5480.80		29.5	5.41	
	05	1730			33.75	5.23	
	07	0830			29.5	3.53	
	09	2030			32.5	5.13	
	11	1230			28.5	4.97	
	13	2030			24.5	1.67	
	15	1200	2249.08		32.5	3.31	
	17	1630	4021.71		29.8	7.85	
	19	1245	4108.07				
	21	1630	5212.00				
	25	0830	2461.88				

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity µMHO/cm	Alkalinity ppm	Remarks
August	29	2230	3513.05		34.0	5.07	
	31	1830	1553.51		37.5	7.77	
September	02	1615	2237.98		41.5	6.83	
	05	1100		1.54	32.0	5.90	
	07	1730		2.52	39.75	5.74	
	09	1630	5777.00	2.52	31.00	5.41	
	12	1800	5210.00	0.99	27.0	5.08	
	16	1830	6077.00	1.98	30.45	6.07	
	18	1745	2640.00	2.20	30.25	4.92	
	19	1600	5237.00	1.87	40.0	1.64	
	20	1830	5712.00	1.98	33.25	6.83	
	21	1520	4834.00	2.20	34.75	6.07	
	21	1623	5983.00	1.98	41.25	5.58	
	21	1722	5671.00	1.21	30.50	13.28	
	21	1820	4953.00	20.23	13.50	5.25	
	21	1925	5177.00	1.98	31.50	5.41	
	21	2023	5136.00	0.33	33.75	5.90	
	22	1450	6048.00	1.87	33.75	5.25	
	22	1635	5440.00	3.30	39.50	5.08	
	22	1700	5377.00	1.32	37.00	7.71	
	23	1530	5918.00	2.20	45.50	5.25	
	26	1015	5443.00	2.20	44.75	5.25	
	28	1415	4389.00				
	28	1945		2.09	30.00	13.61	
	30	1730	5479.00	2.42	35.25	5.08	

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity µMHO/cm	Alkalinity ppm	Remarks
October		1330	5574.00	1.32	28.00	5.08	
	18	1800	4469.31	1.158	31.5	2.296	
	21	1015	4463.45	1.853	37.0	3.936	
	21	1020	4471.09	1.853	33.5	4.920	
	24	1700	4803.47	0.926	36.25	2.788	
	25	1800	6810.71	1.042	35.5	4.92	
	30	1645		1.91	33.4	3.77	
November	01	1715		1.91	36.5	3.94	
	06	1745	2682.66	1.24	34.55	3.94	
	08	1645	4208.95	1.57	31.5	4.26	
	12	1700	5217.85	0.79	35.6	3.94	
	15	1700	4138.01	1.91	31.9	3.77	
	21	1730	5415.2	2.06	28.2	4.10	
	24	1700	5616.7	1.24	28.5	5.43	
	28	1730	5974.5	1.51	27.5	5.25	
	30	1715	4452.5	2.61	29.0	4.14	
December	02	1730	5344.3	1.51	27.0	5.43	
	05	1000	3038.4	1.10	22.2	2.74	
	07	1530	6363.2	0.27	33.5	6.00	
	09	1715	2309.1	1.88	27.0	5.73	
	11	1715	5841.2	2.16	28.0	4.45	
	13	1730	5575.3	1.88	28.8	4.23	
	17	1200	5436.4	2.16	26.5	4.54	
	20	1500	5582.9	1.75	28.5		
	23	1745	3585.8	2.16	28.2	3.43	
	27	1730	5111.7	1.75	28.5	4.95	

Date		Time (Local)	Radon pCi/L (±5%)	Chlorinity ppm	Conductivity μMHO/cm	Alkalinity ppm	Remarks
December	31	0830	2525.1	1.35	23.2	3.28	
1979 January	02	1045	2682.1	1.62	23.0	2.35	
	05	1400	3126.8	2.42	29.0	3.64	
	06	1630	4985.90		30.2	4.25	
	08	0800	2951.60		24.7	2.46	
	10	1715	5253.10		30.9	1.95	
	12	1730	6144.75		29.0	3.45	
	15	1700	4585.66		30.0	2.13	
	18	1630	3537.16		28.0	4.17	
	21	1600	1577.22		27.0		
	25	1730			21.9		
February	09	1800	7392.00		23.45		
	11	1630	4101.00		23.95		